SECTION 2. PRIEST RIVER SUBBASIN ASSESSMENT - 4TH ORDER HUC LEVEL

2.1 Characterization of the Watershed

2.1.0 Introduction

The Priest River basin is 981 square miles in area. The basin is primarily within the northwest corner of the Idaho Panhandle (761 mi^2 of the basin), within Bonner and Boundary counties (Figure 2-1). Headwaters of Upper Priest River originate within the Nelson Mountain Range of British Columbia (24 mi^2 of the basin). Headwaters of major streams on the western side of the basin originate in northeast Washington (198 mi^2 of the basin). The basin is flanked on the east by the Selkirk Mountain range, and bordered on the west by the mountain crest separating the Kaniksu and Colville National Forests. Elevation within the basin ranges from 2,075 ft at the city of Priest River to more than 7,000 ft within the Selkirks. The linear distance from the Canadian border to the city of Priest River is 57 miles.

Hydrologically, the Basin has four major complexes or divisions: 1) Upper Priest River and its tributaries, 2) Upper Priest Lake covering 1,338 acres and receiving Upper Priest River and other tributaries, and including a 2.7 mile outflow channel called The Thorofare which drains to Priest Lake, 3) Priest Lake which covers 23,300 acres and has numerous tributaries, and 4) Lower Priest River, created as outflow from Priest Lake, flows a distance of 45 river miles to its confluence with the Pend Oreille River at the city of Priest River and has several major tributaries.

Within the Priest River basin there are ten §303(d) listed stream segments (Figure 2-2 and Table 2-1). These segments are: Trapper Creek flowing into Upper Priest Lake; Two Mouth Creek, Tango Creek, Reeder Creek, and Kalispell Creek flowing into Priest Lake; Lamb Creek, Binarch Creek, East River, and Lower West Branch Priest River flowing into Lower Priest River; and the main stem of Lower Priest River beginning at the confluence with Upper West Branch Priest River. General information regarding watershed size, elevation ranges, gradient and channel type, and base flow is presented in Table 2-2. A history of listing in State §305(b) and §303(d) reports beginning in 1988 is found in Appendix A.

Clarification is needed regarding some of the stream segment boundaries originally listed in the 1994/96 §303(d) reports as revised in the DEQ 1998 §303(d) List (Table 2-1). For Kalispell Creek, Lamb Creek, and Lower West Branch, the upper boundary in the 1998 §303(d) List (IDEQ 1999) is the Washington - Idaho state line. However, a significant portion of the headwaters and watershed lands of these streams reside in Washington. Any TMDL implementation for sediment reduction would have to take into account these upper areas to be effective in stream improvement. For the most part there should not be a jurisdictional problem for the State of Idaho, since most of the Washington land in the western basin is Idaho Panhandle National Forests managed from the Priest Lake Ranger District. Therefore, assessments in this report will include stream segments and lands within Washington.

One further clarification is needed for the East River. The original listing stated a boundary of, “headwaters to Priest River.” This was originally interpreted to mean the headwaters of Middle Fork East River to the mouth. For undocumented reasons, the boundary was changed to the North Fork East River in the 1998 §303(d) List. This SBA document will consider the entire East River drainage.

The structure of this report is to present a general characterization of the Priest River basin in Section 2; to provide pertinent assessment details for each of the listed §303(d) streams in Section 3 including proposed de-listing and proposed TMDL development for water quality impaired streams; and in Section 4 develop a TMDL loading analysis and allocation for determined impaired streams. The necessity for individual assessments of listed 5th order watersheds in Section 3 is that they are widely separated geographically within the basin, and there is considerable variability in basin characteristics including land use intensity levels when moving from north to south.

Table 2-1. Priest River Basin: Water Body Identification Numbers, and 1994/96 §303(d) Listing Categories

Stream Name	Water Body Identification Number	Pacific Northwest Rivers System	Boundaries as Listed in 1994 §303(d)	Revised Boundaries in 1998 §303(d)	Pollutant/ Parameter Listed[a]
Trapper Creek	ID-17010215-017	1432	Headwaters to Upper Priest Lake		Sed, Halt
Two Mouth Creek		1427	Headwaters to Priest Lake		Sed, Halt
East River	ID-17010215-003 ID-17010215-004	1415	Headwaters to Priest River	Headwaters of Middle Fork to North Fork confluence. Headwaters of North Fork to Priest River.	Sed, DO, Temp, Flow
Tango Creek	ID-17010215-021	1428	Headwaters to Priest Lake		Sed, Nut
Reeder Creek	ID-17010215-023	1424	Headwaters to Priest Lake		Sed
Kalispell Creek	ID-17010215-024	1421	Priest River/ Lake Basin	WA line to Priest Lake	Sed
Lamb Creek	ID-17010215-025	1419	Headwaters to Priest Lake	WA line to Priest Lake	Sed
Binarch Creek	ID-17010215-026	1418	Headwaters to Priest River		Sed
Lower West Branch Priest River	ID-17010215-030	1411	No Boundaries Stated	WA line to Priest River	None Listed
Lower Priest River	ID-17010215-001	1407	Upper West Branch Priest River to Pend Oreille River		Sed

a = Sed: Sediment
Halt: Habitat Alteration
DO: Dissolved Oxygen
Nut: Nutrients
Temp: Temperature

2.1.1 Physical and Biological Attributes

2.1.1.1 Climate

Climatological information is primarily derived from weather monitoring stations within the USFS Priest River Experimental Forest, about 15 miles north of the city of Priest River (Figure 2-1). The current "control" weather station is at elevation 2,380 ft, about the same as Priest Lake surface elevation, with records dating back to 1916 (Finklin 1983).

The climate is transitional between a northern Pacific coastal type and a continental type (Finklin 1983). July and August are the only distinct summer months and temperatures are relatively mild because of the

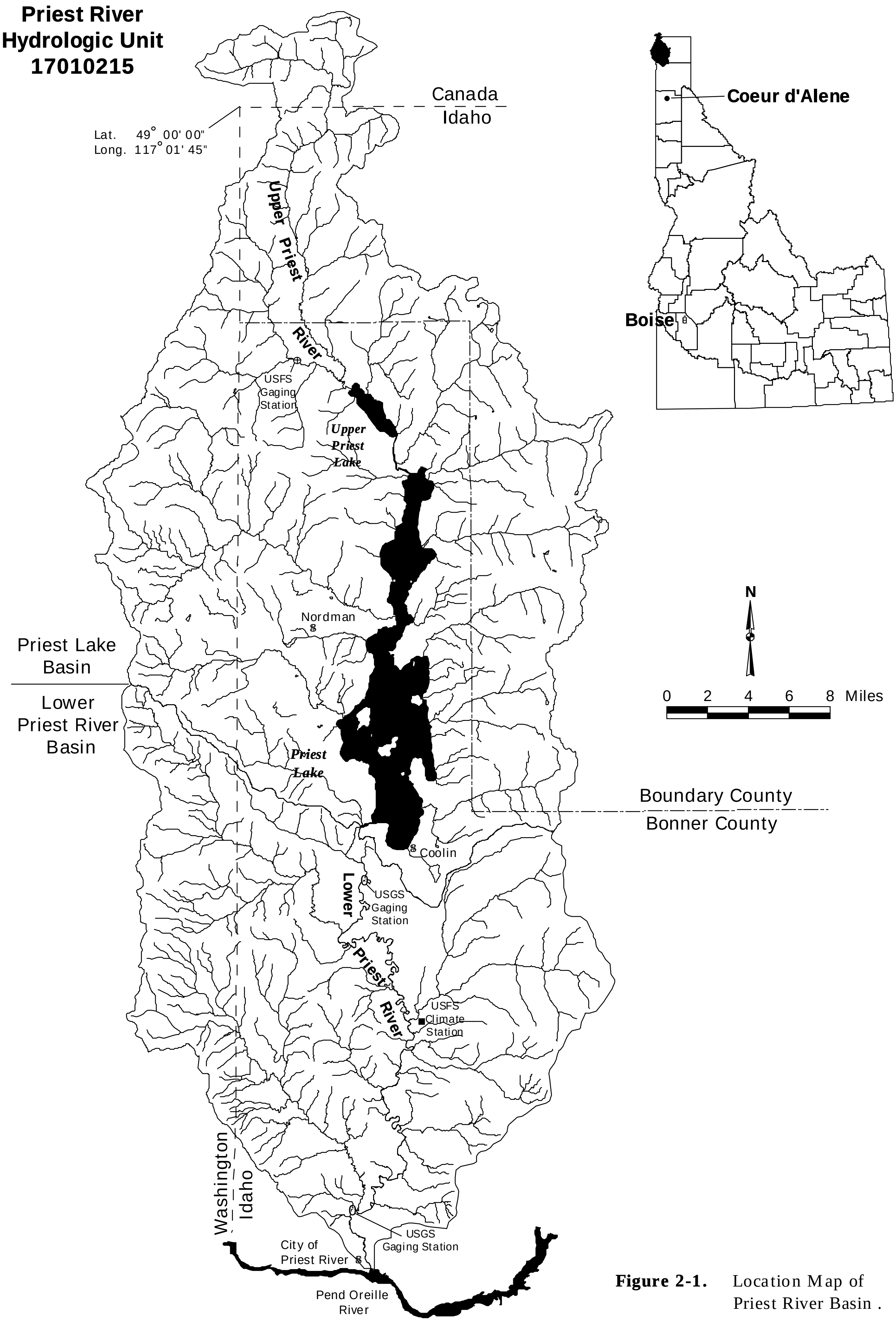

Figure 2-1. Location Map of Priest River Basin .

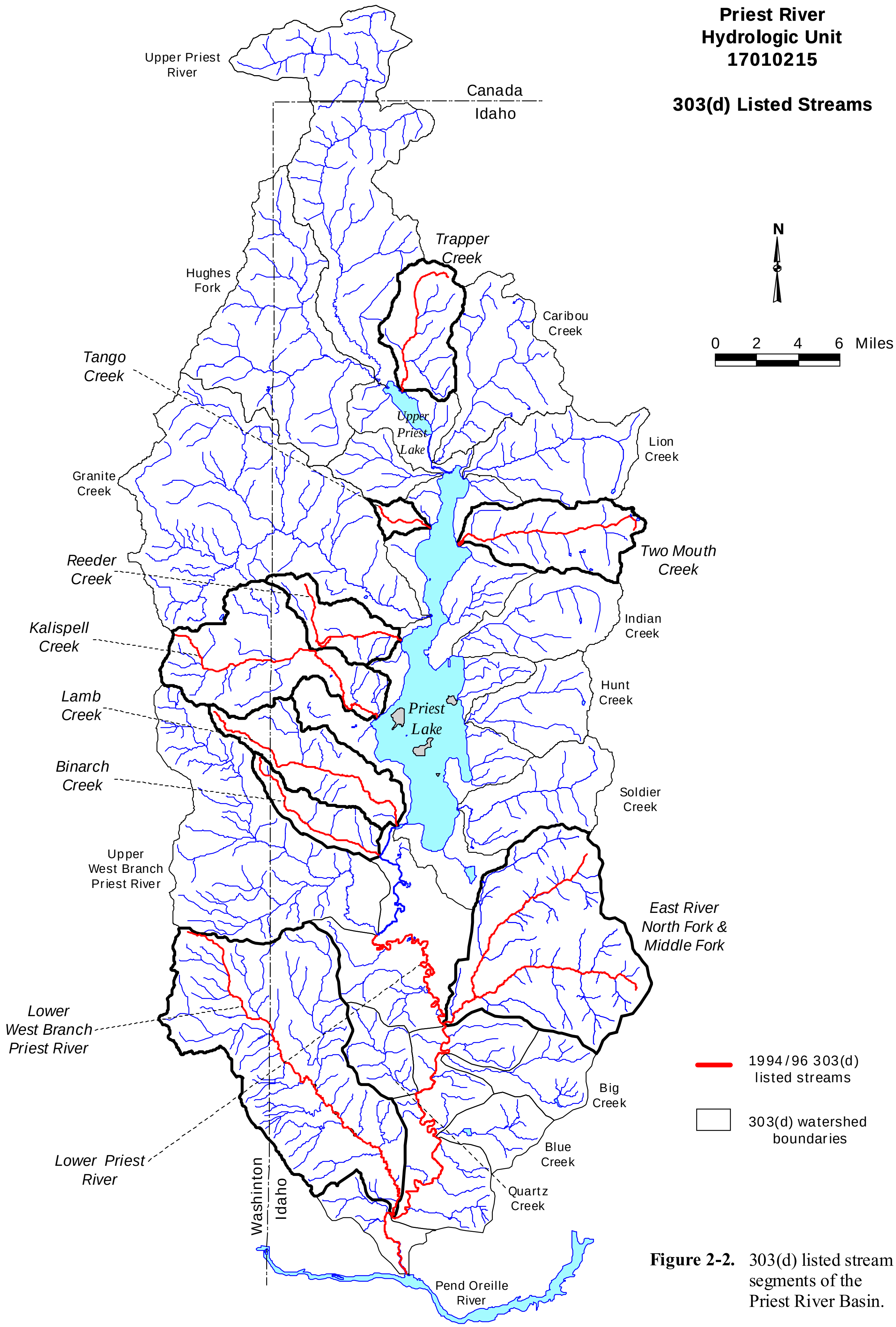

Figure 2-2. 303(d) listed stream segments of the Priest River Basin.

Table 2-2. Priest River Basin: General Characteristics of the §303(d) Listed Stream Segments

Stream Name	Watershed Size (acres)	Elevation Range (ft)	Stream Length (miles)	Stream Order	% Rosgen Channel Type and Gradient C, F, D, E <1.5%	% Rosgen Channel Type and Gradient B+A ≥1.5%	Summer Base Flow near mouth (cfs)
Trapper Creek	12,292	2438-6500	7.9	4th	14%	86%	9[b]
Two Mouth Creek	15,565	2438-7292	10.3	3rd	6%	94%	20[a]
East River							
Main stem	1,881	2230-2280	2.5	4th	100%	0%	55[b]
North Fork	19,494	2280-6706	10.0	3rd	40%	60%	13[b]
Middle Fork	21,788	2280-6706	8.9	3rd	20%	80%	24[b]
Tango Creek	2,003	2438-5200	3.3	1st	0%	100%	1[b]
Reeder Creek	8,291	2438-5074	7.7	2nd	63%	37%	5[a]
Kalispell Creek	25,210	2438-5552	14.6	4th	70%	30%	16[a]
Lamb Creek	15,616	2438-5476	12.8	3rd	56%	44%	6[a]
Binarch Creek	7,232	2420-4170	8.5	2nd	51%	49%	3[b]
Lower West Branch Priest River	56,835	2100-5600	25.3	4th	84%	16%	36[b]
Lower Priest River	219,980	2074-2300	35.3	5th	100%	0%	450[a]

a = flow determined from continuous gage height recorder station
b = flow determined from single BURP flow measurement, summer base flow

pacific maritime influence (average daily summer maximums are around 82ºF). Winter temperatures also are relatively mild compared to areas east of the Rocky Mountains. Annual precipitation (rain and melted snow) averages 32 inches at the "control" weather station. Average precipitation within the peaks of the Selkirk Mountains can reach 60 inches (UI 1995). At elevations above 4,800 ft snowfall accounts for more than 50% of total precipitation (Finklin 1983). The wettest months normally are November, December, and January. The elevation zone between 2,000 ft and approximately 3,500 ft is subject to rapid snow melt from warm and moist mid to late-winter rain storms. The result is that some of the basin watersheds with a high percentage of sensitive snowpack acreage, in particular the lower half of the western side of the basin, can have high discharge rain-on-snow events.

2.1.1.2 Hydrology

The Priest River basin has abundant tributaries (Figure 2-2), with approximately 1,315 miles of perennial streams. Upper and Lower Priest River flow north to south, while the aspects of most other tributaries are east and west. Tributaries on the northern and eastern sides of the basin originate in the Selkirk Mountains and a large percentage of their stream channels are moderate to steep gradient B and A channel type flowing through deep V-shaped mountainous valleys. On the western side of the basin, from Reeder Creek down to Lower West Branch Priest River, a large percentage of the stream lengths have gradual gradients (<1.5%) flowing through valley floodplains with Rosgen C, F, D and E channel types (Rosgen 1985).

A good overall description of surface water volume generated in the basin can be obtained from data at two USGS gauging stations (Figure 2-1). Station Priest River Near Coolin (at the Dickensheet campground), is located 5.2 miles downstream from the Priest Lake outlet dam. Period of record for this station began in 1948. Flow data at this point on the Lower Priest River represents drainage into and from Upper and Lower Priest Lakes in addition to a couple of minor tributaries between the outlet dam and the gauging station. The land drainage area is 600 mi^2, or about two-thirds of the total basin. River flow is partly regulated by the Priest Lake outlet dam which began operation in 1951 (IWRB 1995).

Mean annual runoff at the station near Coolin, through Water Year (WY) 1998, is 931,800 ac-ft (Brennan *et al*. 1999). Approximate calculations produce an average annual yield of surface runoff from land in the Priest Lake basin at 2.4 ac-ft/acre. Surface water yields vary around the lake basin ranging from around 3.0 ac-ft/acre to 1.2 ac-ft/acre (estimates for WY 95, Rothrock and Mosier 1997). Greater yields are from watersheds in the Selkirk Mountains with high elevations, deep snow pack, and considerable rock outcrop in the higher portions of the watershed. Lesser yields are from west side watersheds with lower elevations, less snowpack, and extensive low gradient, glacial till and outwash valleys where aquifers are recharged.

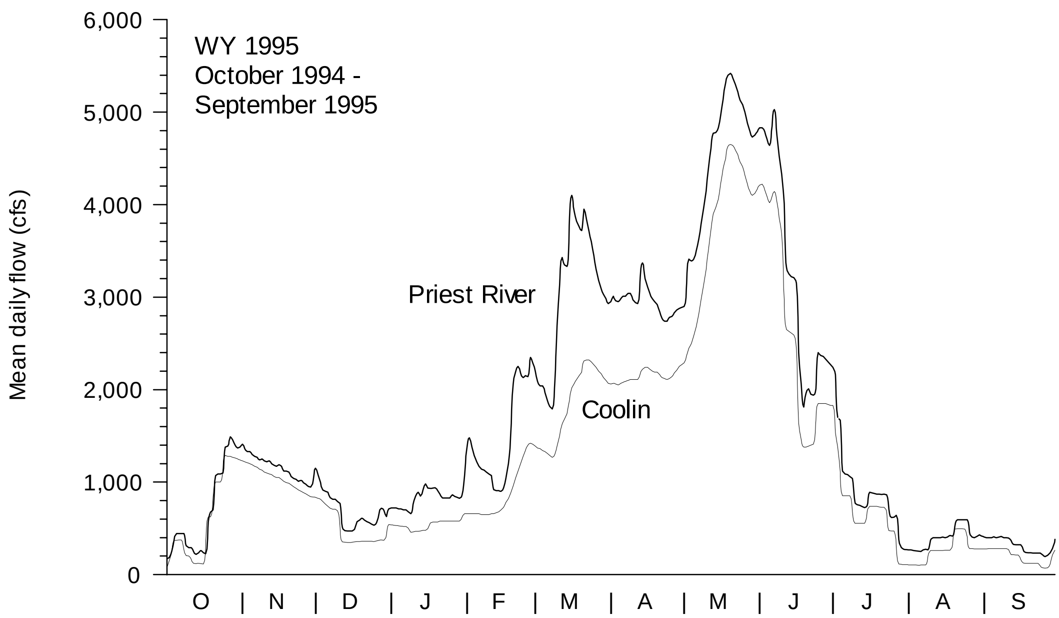

Figure 2-3. Mean daily flow of Lower Priest River for Water Year 1995 as recorded at the USGS gauging stations Priest River Near Coolin (12394000) and Priest River near Priest River (12395000).

Mean daily flow pattern for WY 1995 is shown in Figure 2-3 (Brennan *et al*. 1996). WY 1995 was selected because annual runoff was very close to the period of record average, and there also is considerable measured flow data from Priest Lake tributaries associated with a baseline lake study (Rothrock and Mosier 1997). The annual spring runoff began in mid March corresponding with initial periods of spring warming (daytime maximum air temperatures between 40 - 50 ºF), and rain-on-snow events in lower to mid elevation ranges. Peak flow typically occurs from mid May to early June when daytime air temperatures exceed 80ºF and rapidly melts the mid to high elevation snowpack.

The downstream USGS gauging station is Priest River Near Priest River, located 2.7 miles north of the city of Priest River, at river mile 3.8. Flow records were taken intermittently between 1903 and 1928, and have been taken continuously since 1929. Average annual runoff between WY 1950 - 1998 was 1,249,000 ac-ft. Extremes of annual runoff have been 515,135 ac-ft in 1977, and 2,135,175 ac-ft in 1974. Highest recorded daily mean flow was 10,700 cfs in May 1997, and lowest daily flow was 150 cfs in November 1979.

The average annual runoff for WY 1950 - 1998 at the lower station represents a 25% gain from the upper station. This is water gained from basin watersheds south of Binarch Creek with a total of about 340 mi^2 basin land area. There is consumptive use of river water between the two stations for domestic water supply and agriculture purposes, but percentage extraction is less than 5% of the flow. The two stations also closely bracket the land area that drains into the §303(d) listed segment of Lower Priest River. Surface water yield from this southern one-third of the basin calculates to around 1.4 ac-ft/acre. This is less yield than the Priest Lake basin primarily because of lower average elevation and depth of snow pack. Note in Figure 2-3 a more pronounced rise of the hydrograph during mid-February through late April at the lower station. This likely reflects that the southern one-third of the basin has a higher percentage of lowland to middle elevation acreage (2,100 - 3,500 ft) than the Priest Lake basin. This low to mid elevation sensitive snow pack readily yields runoff during the initial late winter - early spring warmup and rain events.

Of the §303(d) listed streams, Two Mouth, Reeder, Kalispell, and Lamb Creeks have fairly comprehensive water flow records for WY 94 and 95 as a result of the Priest Lake study (Rothrock and Mosier 1997). Lower Priest River is well documented with the USGS stations. For the remaining five listed streams, water measurements are few with no history of gauging stations.

2.1.1.3 Geology and Soils

Geological investigations and mapping of the Priest River basin have been conducted by Savage (1965, 1967) and Miller (1982). Summaries, maps and updates of this work are provided by Bonner County (1989), Buck (1983), McHale (1995), IWRB (1995), and Rothrock and Mosier (1997).

Bedrock of the Priest River basin can be divided into two distinct groups (Figure 2-4). The older is the Precambrian Belt Supergroup series forming the basement complex. The belt series is composed of mildly metamorphosed sedimentary rocks including argillites, siltites, and quartzites (Savage 1967). The oldest and most prevalent of the series is called the Prichard Formation. Uplifting of the belt series constitutes a major rock type within the western half and southeastern portion of the basin. It is common to have metadiabase sills (black igneous rock) layered between belt rock beds. Belt geology weathers to predominately clay and silt sized particles.

The second type of bedrock is the igneous Kaniksu Batholith formation, also called the Selkirk igneous complex. The formation is cretaceous in age. The rock mass is composed of muscovite-biotite granodiorites and quartz monzonite granitic rocks. The plug-shaped Kaniksu batholith pushed up through the precambrian metasedimentary bedrock (McHale 1995). The overlying older bedrock was eroded to

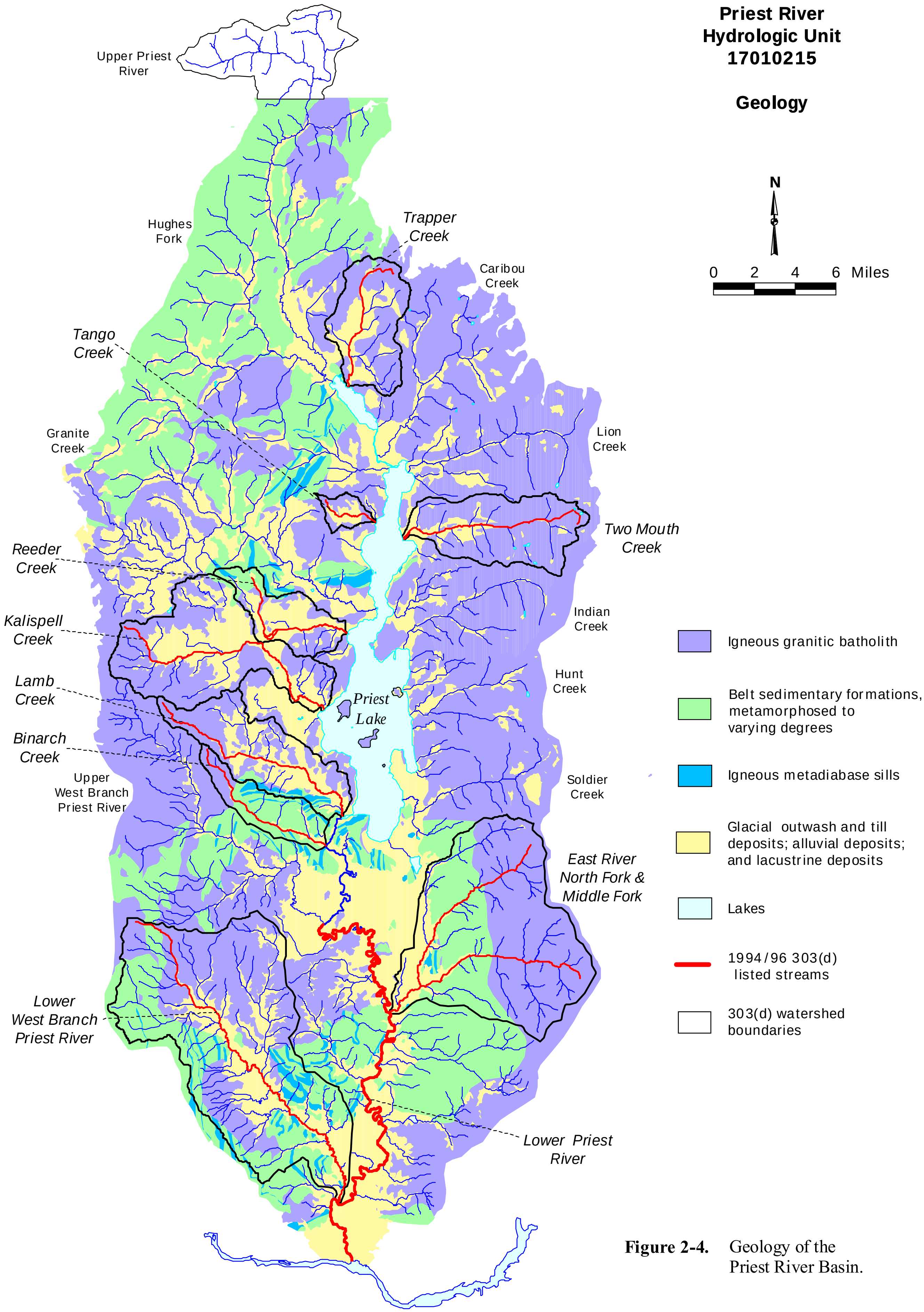

Figure 2-4. Geology of the Priest River Basin.

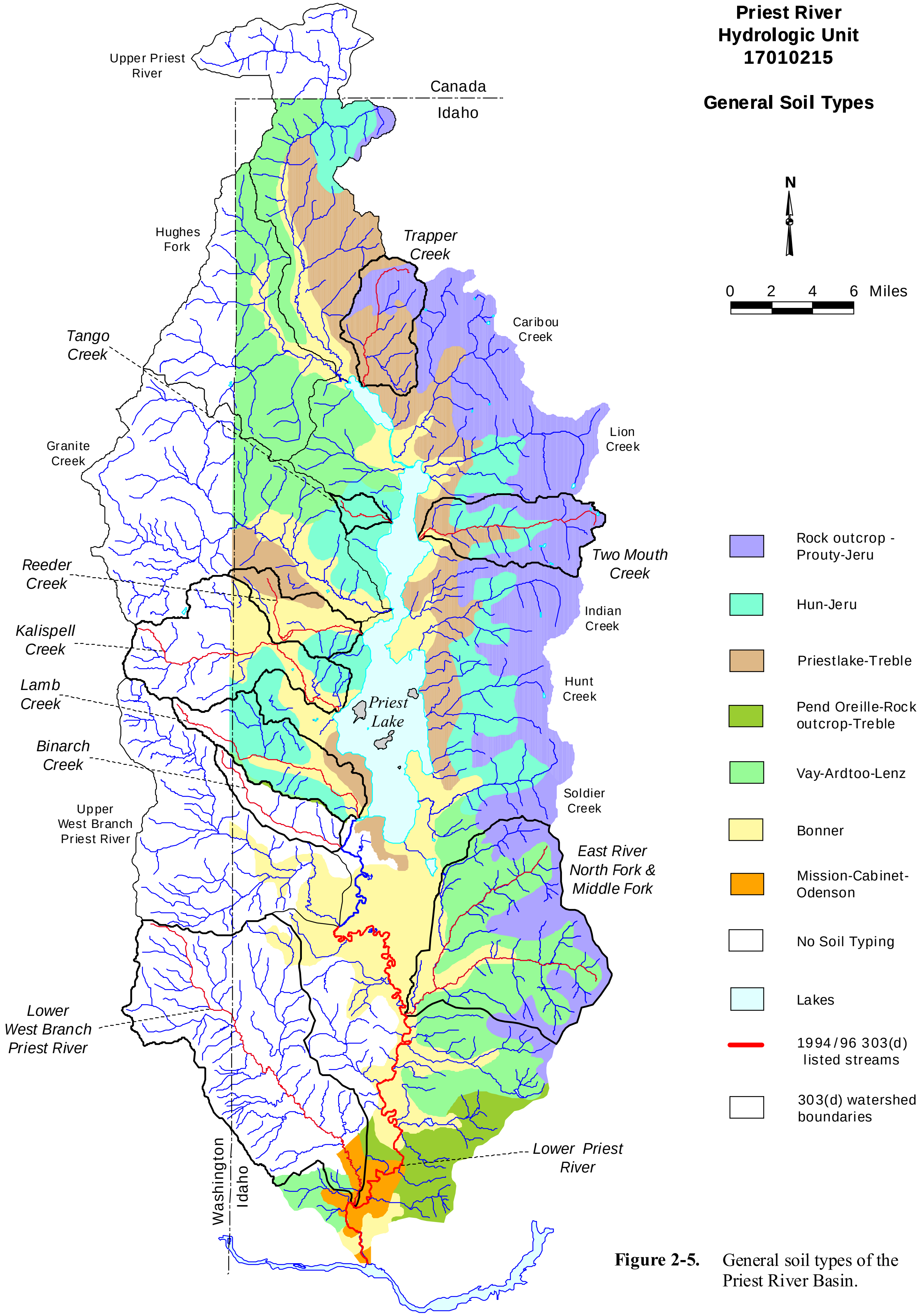

Figure 2-5. General soil types of the Priest River Basin.

Table 2-3. Descriptions of General Soil Map Units in the Priest River Basin (USDA-SCS 1982)

Bonner County General Soil Map Units (USDA-SCS 1982)	Soil description
All general soil groups in the basin	Soils: a mantle of volcanic ash and loess. Rock outcrop: areas of exposed granite, gneiss, and schist on ridges and convex mountainsides.
Rock outcrop - Prouty-Jeru	Glacial till and residual origin. *Rock outcrop, and moderately deep and very deep, steep and very steep, moderately permeable soils; on mountains at high elevations*. Extensive areas of rock outcrop are found at the higher elevations of eastern Priest River basin. Prouty residual soils are on ridges and convex side slopes of mountains. The surface and subsoil are gravelly loam, and the substratum is extremely stony sandy loam. Jeru glacial till soils are on mountainsides. Soil strata are very stony sandy loam.
Hun-Jeru	Glacial till and residual origin. *Deep and very deep, rolling to very steep, moderately rapidly permeable soils; on mountains*. Jeru glacial till warm soils are on foot slopes and on steep and very steep mountainsides. Surface layer is very stony sandy loam, subsoil is gravelly sandy loam, and substratum is very cobbly sandy loam. Hun residual soils are on very steep slopes, with gravelly silt loam at the surface, a subsoil of very gravelly sandy loam, and a substratum of extremely cobbly loamy sand.
Priestlake-Treble	Glacial till origin. *Very deep, well drained, moderately steep to very steep soils: on foothills and mountainsides*. Priestlake soils are on the cooler, north-facing mountainsides. Surface layer is gravelly sandy loam, subsoil very gravelly sandy loam, and substratum is very gravelly loamy sand. Treble, high precipitation soils are at the lower elevations on foothills and the warmer south-facing slopes. Surface layer is gravelly sandy loam, subsoil very gravelly sandy loam, and substratum very cobbly loamy course sand. Klootch and Kruse soils are also common.
Pend Oreille-Rock outcrop-Treble	Glacial till and residual origin. *Very deep, well drained, rolling to very steep soils, and Rock outcrop; on foothills and mountainsides.* Pend Oreille soils are on the lower and cooler, north-facing foothills and mountainsides. Surface layer and subsoil are silt loam, and substratum is gravelly or cobbly sandy loam. Treble soils are on the warmer south-facing side slopes of foothills and mountains. Surface layer is gravelly sandy loam, subsoil very gravelly sandy loam, and substratum very cobbly loamy course sand. Of minor extent are poorly drained Hoodoo and Sagle soils, and deep Lenz, Ardtoo, Vay, and Bonner soils.
Vay-Ardtoo-Lenz	Residual origin. *Moderately deep to very deep, moderately steep to very steep, moderately permeable and moderately rapidly permeable soils; on mountains*. Ardtoo soils are on south-facing side slopes. Surface and subsoil layers are gravelly sandy loam or very gravelly coarse sandy loam. Substratum is weathered gneiss. Vay soils are on the colder and more moist, north-facing side slopes and in ravines. Surface layer is silt loam, subsoil very gravelly sandy loam, and substratum is weathered granite.
Bonner	Glacial outwash origin. *Very deep, level to undulating, well drained soils; on terraces*. Surface layer is silt loam, subsoil is gravelly silt or sandy loam, and the substratum is very gravelly loamy sand or very gravelly coarse sand. In the Priest River basin there are pockets within the outwash of very deep and poorly drained alluvial, lacustrine, and organic derived soils.
Mission-Cabinet-Odenson	Glacial silty lake-laid sediment. *Very deep, level to hilly, somewhat poorly drained to excessively drained soils; on alluvial fans, terraces, and dunes.* Mission soils are in higher areas of terraces. Shallow to a hardpan and somewhat poorly drained. Surface layer is silt loam, subsoil is silt and clay loam, and substratum is fine sand to silty clay. Odenson soils are in the lower, wetter areas on terraces. Soils are very deep and poorly drained. Surface layer is silt loam, subsoil is silty clay loam, and substratum very fine sandy loam to silty clay.

expose the batholith. The batholith intrusion caused regional tectonic swelling which formed the Selkirk Mountains to the east of Priest Lake (Harvey 1994). Batholith is the predominant bedrock of the eastern side of Priest River basin, extending north to the Trapper Creek watershed. Areas of granitic formations are also found on the west side. Granitics weather to very fine gravel and sand sized particles (1 - 8 mm).

Periods of glaciation and ice retreats left extensive surface deposits overlying bedrock in the basin (Figure 2-4), and had great influence on soil development. These deposits include mixes of boulders, gravels, sands, silts, and clays. Soil origin groups from ice are: glacial till soils on foot slopes and mountainsides formed from unconsolidated material deposited by glacial ice; and glacial outwash soils in lowlands deposited by ice meltwater in layers of clay, sand and gravel. Other soil origin groups are: alluvial soils formed from deposits along stream banks and in alluvial fans; lacustrine deposits of fine clay, silt, and sand, associated with glacial lakebeds; and organic soils derived predominantly from herbaceous plants. The geologies of the lower Priest River drainage are more weathered than those in the Priest Lake basin because the lower basin did not experience the ice flows of the last glaciation (USFS 1999).

A Bonner County soil survey conducted by the Soil Conservation Service (USDA-SCS 1982) provides detailed soil mapping (1:24,000 map scale) for the east side of the basin, on State and private land, from Trapper Creek down to the city of Priest River. Detailed SCS soil mapping does not exist for the west side of the basin on federally owned and private land. There is also a SCS General Soil Map (1:380,160 scale) constructed for the areas that have been soil typed and this map shows broad areas that have a distinctive pattern of soils, relief, and drainage (USDA-SCS 1982). The General Soil Map has been updated to include the west side of the Priest Lake basin to the Washington Border (Figure 2-5, unpublished data provided by the SCS Coeur d'Alene office). Descriptions of these soil groups are presented in Table 2-3. The USFS has supplied a base geology landtype map for the western half of the basin which was used for calculating natural sediment yield from forested land (see Figure 4-2, page 163). Landtype units are based on local geomorphology, hydrology, and soil characteristics. General soil types could be inferred from this map (Niehoff *pers comm*).

The soil profile of many undisturbed soils in the area begin with a surface layer of an organic duff mat of needles, leaves and twigs, and a highly decomposed organic layer beneath. Below is a mantle of volcanic ash and loess (wind-deposited silt). The volcanic ash cap of basin soils plays an important role because soil productivity is highest with a thick ash cap, and surface erosion is often low because of rapid water infiltration through the cap (Janecek Cobb *pers comm*). Most commonly, basin soils are deep and well drained with a high component of gravel and sand. Glacial outwash and till are extensive in the foothills and lowlands surrounding Priest Lake and the valley bordering Lower Priest River. Much of the material is coarse grained and deep, and around Priest Lake supports unconfined aquifers. Within these glacial deposits are pockets of lacustrine fine grained silts and clays, and organic soils. Moderately steep to very steep mountainsides of the basin have primarily residual soils, bedrock weathered in-place. Particularly in the higher elevations of Priest Lake basin there are extensive areas of rock outcrop.

Because of the predominance of granitic geology, a major sediment component to streams is sand sized particles. Also, lowland stream segments have entrenched themselves into outwash deposits. Assessment of basin streams in the lowlands of gradual gradient often shows extensive stream beds of thick sand. This is particularly true of §303(d) listed streams on the west side from Reeder Creek down to the city of Priest River. An important yet difficult part of the SBA and TMDL process is to partition this bedload into what would occur naturally and what has been accelerated by land use activities.

With land use disturbance there is a high inherent hazard for surface erosion in the basin because of the rather extensive landscape of moderate to steep slopes (15 to 65%), soils derived from granitics, and glaciated land (IDL 1997a). In general, the inherent mass failure hazard in the basin is rated as moderate. From the standpoint of road building and erosion, areas of belt rock geology are considered fairly stable against surface erosion (IDEQ 1997). Areas of glacial till and granitic residual soils are considered an unstable geologic condition for roads.

2.1.1.4 Vegetative Cover and Wildfire

Vegetation of the area varies in association with: dry to moist to wetland soil conditions, slope aspect, elevation, precipitation and temperature, wildfire history, plant diseases, and land use patterns. The area is predominately coniferous forest. In the higher elevations of the Selkirk range, subalpine fir and Engelmann spruce are the dominant species. A large area on both the east and west sides of the basin, below about 5,000 ft elevation, is occupied by western red cedar and western hemlock in moist soils, and Douglas-fir, grand fir, western larch, white pine, lodgepole pine, and ponderosa pine in semi-dry to dry soils. There are some spectacular stands of old growth cedar.

Historically, western white pine and western larch were dominant species along with a mix of other long-lived species such as ponderosa pine that established after major wildfires (USFS 1999). White pine has suffered severe mortality rates due to the introduced blister rust pathogen. Along with effective fire suppression over the last fifty years and a century of timber harvesting and replanting, disturbance and successional regimes have been altered and the make-up of the basin's coniferous species has changed. The basin's forests now have a high component of Douglas-fir, grand fir, western hemlock, and western red cedar which are more shade-tolerant trees, and which are more abundant now than their historic levels (USFS 1999). Currently, forest sections in the southern basin are experiencing mortality caused by the Douglas-fir beetle triggered by significant blowdown and breakage in the winter of 1996/97 from ice and heavy snow.

Understory and open field shrubs and forbs include: thimbleberry, huckleberry, ceanothus, pachistima, mountain maple, devil's club, ocean spray, and snowberry (Javorka 1983). Along stream riparian areas are birch, aspen, cottonwood, alder, dogwood, and willow. Numerous wetlands with associated vegetation are in the basin. Hager Lake Fen, a valley peatland (uncommon in Idaho) in the lower Kalispell Creek watershed, has received considerable scientific research with its vast habitat and flora diversity including plants considered rare in the state (Bursik 1994).

No endangered plants as listed under the federal Endangered Species Act (1973), are known to exist in the area (USFS 2000c). Ute ladies'-tresses (*Spiranthes diluvialis,* a rare orchid) is listed as threatened in Boundary and Bonner Counties, and water howellia (*Howellia aquatilis*) is listed as threatened for the Idaho Panhandle National Forests (USFS 2000c). There are rare, threatened, and endangered plant species listed under various state and federal criteria, i.e. Regional Federal Sensitive Plants, Taxa of Federal and State Concern, and Taxa of State and Federal Watch Lists (Javorka 1983 and USFS 1988).

A rather extensive invasion of noxious weeds has occurred in the basin. Species include spotted knapweed, meadow and orange hawkweeds, Dalmation toadflax, and Canadian thistle. An aggressive weed control project has been proposed and is being implemented on National Forest lands (USFS 1996).

As in any forested area, wildland fires have been a major factor in the Priest River basin by affecting the characteristics of vegetative cover and ultimately drainage runoff. Prior to Euro-American settlement, fire was the most influential pulse disturbance on the landscape, with an estimated occurrence of large fires around 100 to 150 years. Lightning strikes are common in the basin, and it is also believed that Native Americans used fire for clearing purposes (USFS 1999). From early recorded history (after settlement in the late 1800s), there were large stand-replacing fires between the years of 1880 and 1939 (Figure 2-6). In some watersheds such as Kalispell and Lamb Creeks, over 50% of the landscape experienced large burns, and some areas have been burned over two and three times. In other watersheds, such as Lower West Branch Priest River, most of the landscape has been spared large fires over the past century. The Forest Service believes that in some watersheds, early century fires were so extensive that increased water yields from the hydrologic openings reached a point where the natural channel size could not handle them (USFS 1999). Recurrent flooding damaged stream banks and widened streams. As stream width increased, riparian trees toppled. Historically, fires had a major role in stream dynamics (Janecek Cobb *pers comm*).

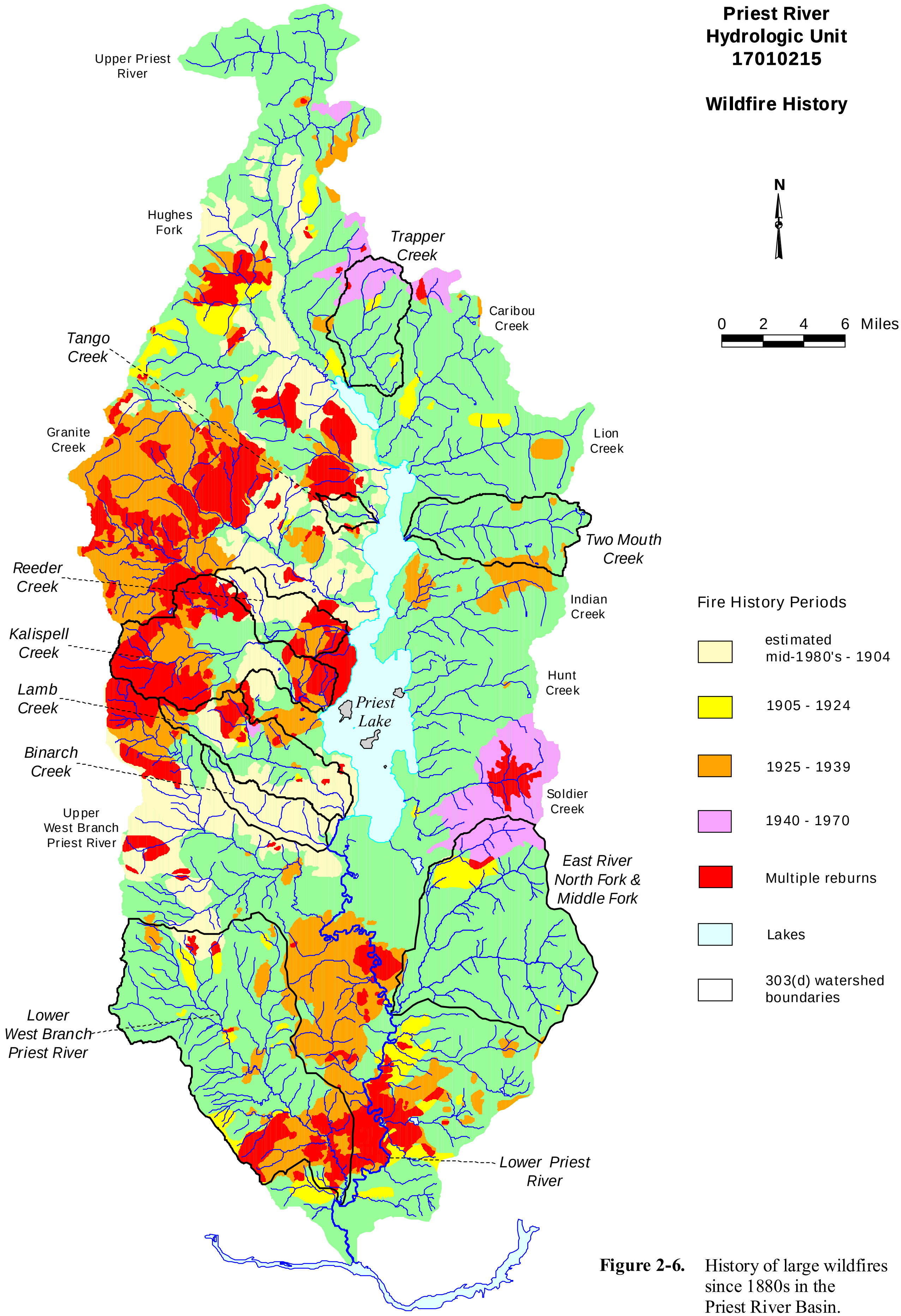

Figure 2-6. History of large wildfires since 1880s in the Priest River Basin.

Early century logging patterns often related to the fire history, and in burned areas, logging practices may have hindered natural stream recovery after fire (USFS 1999). In burned watersheds there was mostly salvage logging operations, and this included the taking of burnt and toppled riparian conifers. Left in place, these riparian trees would have started the process of stabilizing stream channels by creating log steps, trapping bedload sediments and forming channel bars (USFS 1999). In watersheds not experiencing large fires between 1880 -1939, such as Lower West Branch, there was extensive early century logging where the target was large and valuable species such as white pine.

While there has been effective fire suppression in modern times, there were two large fires in 1967 which burned out of control: one in the Trapper Peak area northeast of Upper Priest Lake, and also the Sundance Mountain fire, east of Coolin (Figure 2-6).

2.1.1.5 Fisheries

Historically, four native salmonids have been reported in the Priest River basin: westslope cutthroat trout, bull trout, mountain whitefish, and pygmy whitefish. Other native fishes are northern pike minnow (*Ptychocheilus oregonensis*, formerly squawfish), largescale sucker, longnose sucker, slimy sculpin, shorthead sculpin, longnose dace, speckled dace, peamouth chub, and redside shiner (USFS 1999). Introduced species include brook trout, rainbow trout, brown trout, and in 1925 lake trout (mackinaw) were planted in Priest Lake. Kokanee salmon were introduced to the lake during the 1940s, and became an extremely popular fishery. But, for various postulated reasons including the introduction of mysis shrimp in the 1960s, the kokanee population declined in the 1970s and now there are only remnant populations in Priest Lake and Upper Priest Lake. Priest Lake also has largemouth bass and yellow perch. The fishery in Blue Lake (southeastern section of the basin) includes pumpkinseed, brown bullhead and channel catfish.

In 1998 the USF&WS listed bull trout (*Salvelinus confluentus*, a distinct species of char), as threatened under the federal Endangered Species Act (1973). The westslope cutthroat trout is considered a Species of Special Concern by the State of Idaho, and as a “sensitive species” by Region 1 of the USFS. Cutthroat trout can be found in most tributaries in the basin, but the current range of bull trout is limited, primarily found in streams of the northern one-third of the basin and Upper Priest Lake. Both species have stream resident populations, and migratory populations that are adfluvial (residing in Upper and Lower Priest Lakes), or fluvial (Lower Priest River). By historic accounts both species in all three life history strategies (resident, adfluvial, fluvial) were abundant in the basin system (Bjornn 1957), but now geographic range and population numbers are diminished. Cutthroat trout are mainly found as resident populations in headwater streams, although there is still a reasonably robust adfluvial population in Upper Priest Lake (Corsi *pers comm*). There is a diminished or depressed adfluvial cutthroat population in Priest Lake, and a diminished fluvial population in Lower Priest River.

The Idaho Department of Fish and Game has established several protective limitations: bull trout must be released if caught in any waters; tributaries to Upper Priest Lake and The Thorofare had been closed to fishing since 1945, but in 2000 regulations were changed to allow catch-and-release fishing; Upper Priest Lake is catch-and-release only; and there are restrictions on cutthroat trout fishing in tributaries to Lower Priest Lake. Tributaries to Lower Priest River are under general fishing regulations.

The decline in bull trout and cutthroat populations has been attributed to several factors. Both species have preferred instream habitat conditions of: cold and clear water; riffles, runs and pool tailouts with gravel beds of low percent fines for spawning; and deep pools with complex cover for feeding, resting and over-wintering. In many basin watersheds, a century of land use has led to some degradation of stream habitat. There also is the food and space competition factor of introduced brook trout which are now abundant in basin streams. Brook trout have less stringent environmental requirements than the native trout and do sufficiently well within the low gradient, depositional stream segments with sandy-silty bottoms and low quality pools. IDFG believes that the presence of brook trout, with few or no cutthroat or bull trout present in a stream where they were historically present, is possibly an indication that water quality has declined (IDFG, 2001). Brook trout may also have a reproductive advantage over bull trout because they mature earlier, and hybridization of the two species can occur and may be a detriment to isolated bull trout populations (Panhandle Bull Trout TAT 1998a).

The expansion of lake trout in Priest Lake and also recently in Upper Priest Lake is believed to have suppressed bull trout and cutthroat throat populations due to predation on juvenile adfluvial fish (Panhandle Bull Trout TAT 1998a). The Priest Lake outlet dam built in 1950 also prevented migration upstream from Lower Priest River into the lake, but the reconstructed dam (1978) has radial gates opening from the bottom.

Prior to the federal listing of bull trout, a Bull Trout Conservation Plan was introduced by the office of Idaho Governor Philip Batt (State of Idaho 1996). The majority of the Priest Lake basin was identified as a key bull trout watershed, recommended for habitat protection and restoration. A bull trout Problem Assessment, and Conservation Plan have been completed for the Lake Pend Oreille key watershed (Panhandle Bull Trout TAT 1998b, and Lake Pend Oreille Bull Trout WAG 1999). These plans will be used as templates for development of assessments and conservation plans for Priest Lake. Plans for Priest Lake will not, however, be prepared prior to completion of this SBA and TMDL. Bull trout plans may be incorporated into the implementation phase of applicable TMDLs.

2.1.1.6 Stream Characteristics

Streams of the northern and eastern portion of the basin (starting north at Hughes Fork and Upper Priest River and moving down the east side to East River, Figure 2-2), have a high percentage of their stream length in B and A channel types, with long segments of moderate to steep gradients, 4 - 15% and steeper. Tributary streams are characterized by steep, highly confined, bedrock, boulder, 1st and 2nd order streams that combine into the main stem. Streams have falls and cascading rapids, and interspersed gravel-riffle, sand-silt, and boulder-bedrock bottom types. Conifer shade is plentiful except in areas where logging prior to the Idaho Forest Practice Act (FPA), adopted in 1974, eliminated large cedar and hemlock down to the stream bank. Log jams in the streams are common in these stretches. Within lower segments of the main stem streams, there are moderate gradient B channels (1.5 - 4%); and gradual gradient (<1.5%) segments that are either confined F channel or unconfined C channel types. Some segments have abundant gravel and cobble in riffles, runs and pool tailouts. In depositional zones there are also segments of thick granitic sand. In lower stream sections there are areas of floodplain development. Road construction up the stream valleys has in places restricted the effective function of the floodplains. There are several large areas of wetlands-wet meadows, such as Hughes Meadows.

On the western side of the basin, Granite Creek represents a transition from northern and eastern stream types to west and southwest types. Granite Creek is the single largest watershed in the basin at 64,024 acres, and spring high flow near the mouth typically nears 1,000 cfs. The extensive tributary system of the north and south forks are similar to northern streams in gradient, conifer cover and stream bed composition, except that mountain ridges are lower in elevation than the Selkirks. Logging activity and road density is greater in the Granite Creek watershed compared to drainages to the north.

Beginning at Reeder Creek and moving south down to Lower West Branch, these west side streams are significantly different in character than northern and eastern streams. These streams, flowing east, have a long, low profile with little increase in elevation between the mouth and headwaters. The U-shaped valleys are representative of the effects of continental glaciation (USFS 1989). From 50 - 80% of the main stem lengths are low gradient, less than 1.5%, and often less than 0.5%. Channel type can be confined F or G, unconfined C or E channel, or unconfined braided D channel. Considerable floodplain development is evident ranging from 50 to greater than 500 feet wide. On a relative basis, basin wide, the western watersheds have had a moderate to high level of land use including timber harvesting and road building, urbanization, and agriculture which has included cross drainage and channel straightening in an effort to convert some of the wetlands and wet meadows to hay cropping and cattle grazing.

The riparian area of unconfined channels is mainly alder, willow, dogwood and other shrubs. The soil is often too moist for conifers. Where banks are confined, there can be dense conifer overstory. There is a sufficient gravel and cobble component in the watershed soils for recruitment to streams, and there are stretches of riffles, runs and pool tailouts with suitable gravels for spawning. There are however long stretches of stream beds with thick sand and high cobble embeddedness. There is also a silt and clay component where there is belt rock geology. In the lowlands, meander pools are common and woody debris pools are mostly formed from alder and willows which may not last past high flow seasons. Beaver dams and ponds are very common and play an unique role in the ecology of these lowland streams. Main stem headwaters and tributary streams from the foothills and mountains are mainly B and A channel type, with large woody debris and boulder pools. These streams are extremely important as they contain the few cutthroat populations (resident) that remain in the mid to lower western basin.

2.1.2 Cultural Characteristics

2.1.2.1 Land Ownership and Land Use

Land ownership within the Priest River basin is shown in Figure 2-7, with a breakdown of ownership acreage by general land use designations presented in Table 2-4. Over 85 percent of the basin is forested, administered by state, federal and Canadian provincial agencies. The majority of west side land is Idaho Panhandle National Forests administered through the USFS Priest Lake Ranger District. These public lands are managed primarily for timber production, but some lands are Special Management Areas (including experimental forests and recreation areas), Research Natural Areas, federal grazing allotments, and some land is leased for cabin and business development (Figure 2-8).

Table 2-4. Ownership and Land Use within the Priest River Basin

	Land Use Categories in Acres					
Ownership	**Timber**	**Special Mgt. Areas, Research Natural Areas**	**Hay Cropping, Range Land, Grazing Allotments**	**Residential, Business, Recreation**	**Totals**	**% of Basin Total**
Canada	15,354	--	--	--	15,354	2.4
Idaho Panhandle National Forests	266,716	27,743	23,031	5,891	323,380	51.5
U.S. Bureau of Land Mgt.	616	--	--	--	616	0.1
Idaho Department of Lands	172,497	21,455	9,279	359	203,590	32.4
Idaho Dept of Parks & Rec.	--	--	--	846	846	0.1
Private Industrial Timber	8,668	--	--	--	8,668	1.4
Private	12,781	--	30,149	6,481	49,410	7.9
Open Water	--	--	--	--	25,948	4.1
Total	476,631	49,198	62,459	13,577	627,812	

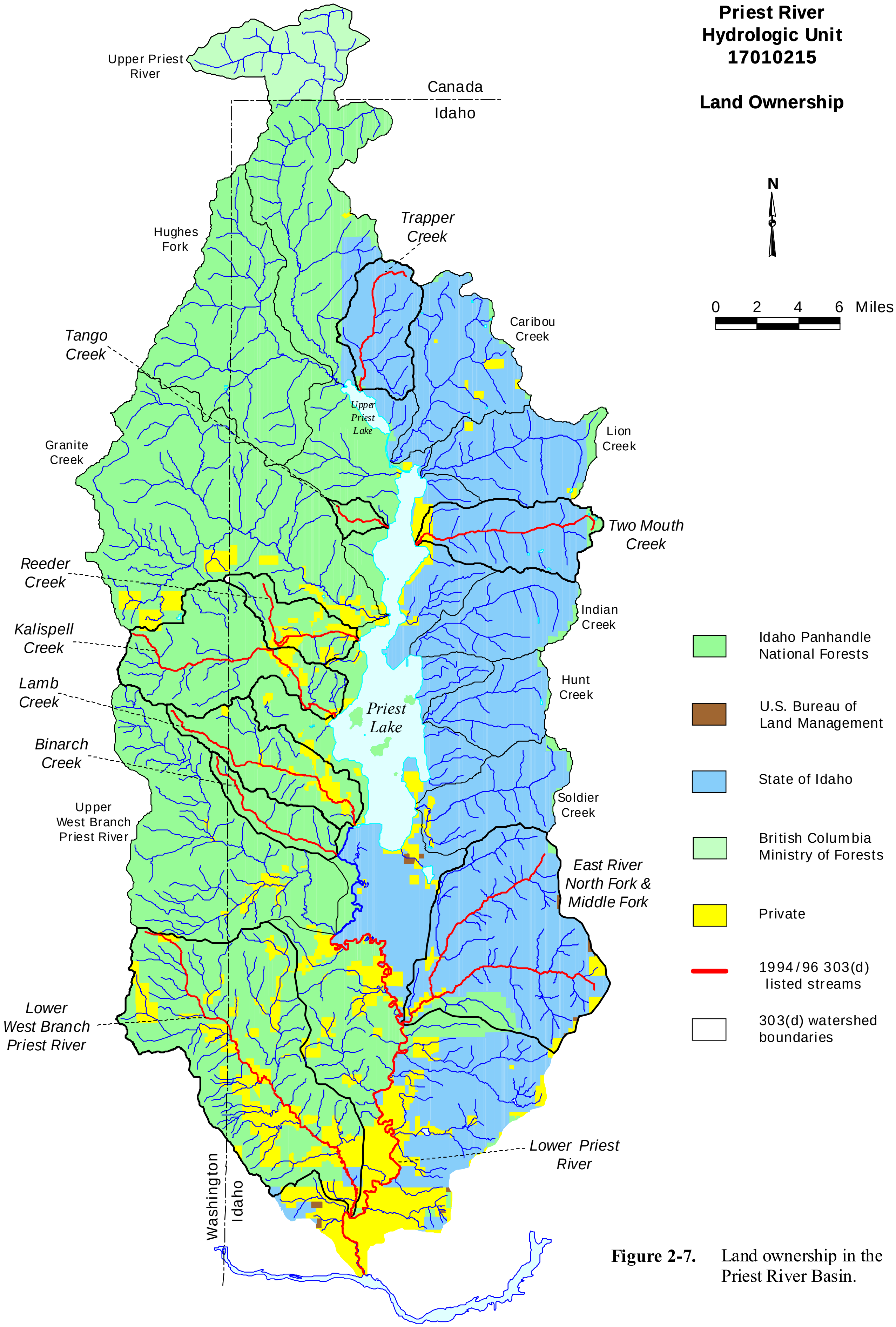

Figure 2-7. Land ownership in the Priest River Basin.

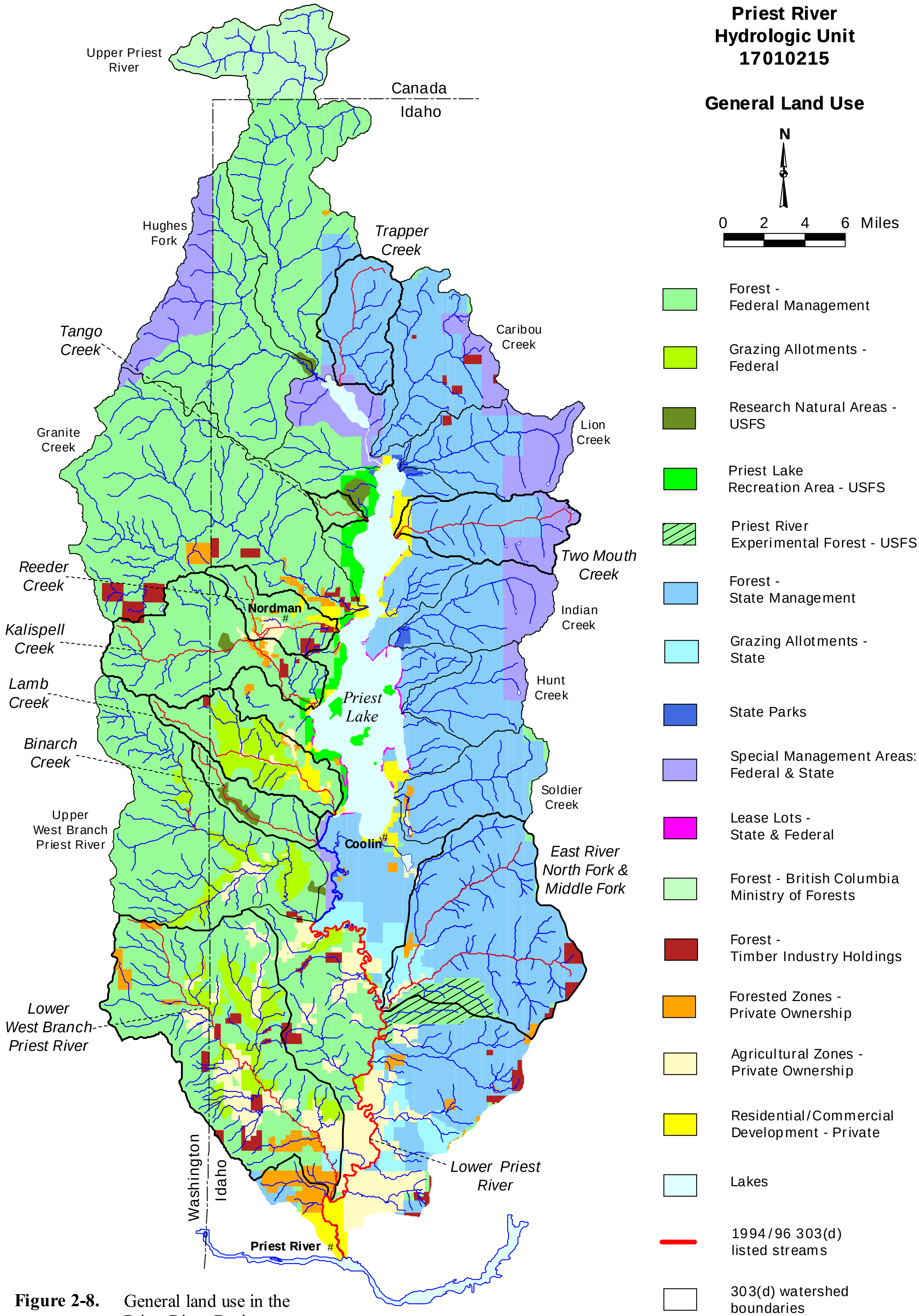

Figure 2-8. General land use in the Priest River Basin.

The majority of the basin's eastern side is owned by the State of Idaho with the northern boundary incorporating the Trapper Creek watershed. Most of this land is administered by the Idaho Department of Lands under the State Endowment Trust. Through the years, various property exchange agreements have transferred a substantial acreage of private industrial timber lands to the state, as well as to the National Forest. State land is primarily managed for timber production, but some state land is leased for lake cottages, and there are some state grazing allotments. The Idaho Department of Parks and Recreation manages a portion of state land as the Priest Lake State Park.

Private lands comprise about 9% of the basin. Around the Priest Lake shoreline 25% of the property is privately owned (Bonner County 1989), and it is there that the most concentrated residential and business development has occurred in the lake basin. The major private ownership block and residential center is the area surrounding the city of Priest River and the lower half of Priest River. In the land use map (Figure 2-8) substantial private acreage along Lower Priest River and Lower West Branch have been classified as agricultural. In these zones there has been a degree of land clearing followed by hay cropping and cattle grazing. Other private lands have been classified as timber, or Non-industrial Private Forest (NIPF). Land activities on NIPF have importance in regards to sediment yield to streams because results of forest audits have shown that NIPF land-owners generally have more departures from BMPs than found in other ownerships (IDL *et al*. 1993). The three categories of private ownership: residential, agricultural, and timber (excluding industrial timber), are meant only as general and approximate acreages and boundaries. Timber harvesting followed by road building and residential lot development occur throughout private lands; there are non-industrial forest practices on agricultural lands; and there are small grazing acreages with horses, cattle, sheep and llamas in rural-residential and forest lands.

There are also blocks of private industrial timber lands. These lands are owned by Burlington Northern Inc. Timber, DAW Forest Products, Crown Pacific, and Stimson Lumber Company.

Land ownership within watersheds of the §303(d) listed streams is presented in Table 2-5. Ownership acreage has been separated out between Idaho and Washington. The upper watershed portions of listed Kalispell Creek, Lamb Creek, Binarch Creek, and Lower West Branch, as well as non-listed Upper West Branch which is a major tributary to the listed Lower Priest River, and also the non-listed Granite Creek and Hughes Fork, reside in the state of Washington. The 1998 §303(d) List revised the boundaries of the first three streams above, listing them as segments beginning at the Washington line (IDEQ 1999). However, for effective reduction in sediment load when stipulated by a TMDL, land use and acreage in Washington must be considered. For the most part this should not be a jurisdictional problem for the State of Idaho because management of federal lands comes from the Priest Lake Ranger District. But jurisdiction is a problem on private lands engaged in timber production and agriculture in Washington.

Special Management Areas and Research Natural Areas (RNA) in the Priest River basin highlight unique resources (IWRB 1995). These include: Upper Priest Lake Scenic Area, Salmo-Priest Wilderness Area, Priest Lake Recreation Area on the western shoreline, the Selkirk Crest Special Management Area, Priest River Experimental Forest, Binarch RNA, and Potholes RNA. Upper Priest River is currently being proposed for Wild River designation under the national Wild and Scenic Rivers Act.

2.1.2.2 Protected River Designations, Minimum Stream Flow, Appropriated Water Use

There are state protected streams, as designated with legislative authority by the Idaho Water Resources Board (IWRB 1995). Upper Priest River, Upper Priest Lake, and The Thorofare are designated as State Natural Rivers with major restrictions on instream alterations to preserve their scenic and recreational values, and to protect fish and wildlife habitat. Hughes Fork, Granite Creek, Trapper Creek, Lion Creek,

Table 2-5. Ownership in §303(d) Watersheds of the Priest River Basin

	Ownership Categories in Acres, Percentages in Parenthesis						
	Federal		Private		Idaho	Open	
Stream	Idaho	Wash.	Idaho	Wash.	State	Water	Total
Trapper Creek	273 (2)	--	0	--	12,039 (98)	0	12,292
Two Mouth Creek	821 (5)	--	573 (4)	--	14,136 (91)	34 (0.2)	15,565
East River	3,552 (8)	--	1,975 (5)	--	37,637 (87)	0	43,163
Tango Creek	2,003 (100)	--	0	--	--	0	2,003
Reeder Creek	5,986 (72)	52 (0.6)	2,253 (27)	0	--	0	8,291
Kalispell Creek	8,670 (34)	15,179 (60)	1,286 (5)	74 (0.3)	--	3	25,210
Lamb Creek	10,470 (67)	2,850 (18)	2,199 (14)	98 (0.6)	--	0	15,616
Binarch Creek	6,517 (90)	715 (10)	0	0	--	0	7,232
Lower West Branch Priest River	24,473 (43)	18,270 (32)	11,233 (20)	2,132 (4)	727 (1)	0	56,835
Lower Priest River	62,301 (28)	48,637 (22)	38,041 (17)	2,296 (1)	67,885 (31)	820 (0.4)	219,980

Two Mouth Creek, Indian Creek, and the upper two-thirds of Lower Priest River are designated as State Recreational Rivers to preserve and protect fish and wildlife habitat, but with stream bed alterations allowed for maintenance and construction of bridges and culverts. In addition there are streams under the Northwest Power Planning Council Protected River Program for resident fish and wildlife, and these include the §303(d) listed streams, Tango Creek, Kalispell Creek, North and Middle Forks East River, and Moores Creek a tributary to Lower West Branch.

In 1951 the State of Idaho completed construction of the outlet structure at the mouth of Priest Lake, and the dam was reconstructed in 1978. A primary purpose for the dam was to stabilize summer lake levels for recreation use. Avista Utilities (formerly Washington Water Power Company) operates and maintains the outlet structure. Prior to completion of the dam, Lower Priest River summer flows were approximately 200 cfs greater than they are today (IWRB 1995). IDFG has listed a minimum recommended rearing flow for adult and juvenile cutthroat trout and adult rainbow trout in the river as 200 cfs from August 1 to October 31, with an optimum rearing flow of 400 cfs (IWRB 1995). Flows at the upper USGS gage site commonly fall well below 200 cfs during August and September. The IWRB has investigated spring - summer alternative operations of the outlet structure to enhance Lower Priest River flow, and conducted public hearings on this issue in 1995. But to date no changes in operation have been agreed upon. The IWRB and Avista are working on agreements to alter the autumn operating scheme to produce more gradual river flows during the annual lake drawdown of 3 feet.

Water appropriations are primarily nonconsumptive with water rights for recreation, aesthetics, fish and wildlife held by the State of Idaho. Appropriated consumptive uses of basin waters is small, approximately 20,000 ac-ft annually mainly for irrigation and domestic water supplies. No hydropower projects are located within the Priest River basin.

2.1.2.3 Regional History and Population

Accounts of the history, cultural resources, and archaeology of the Priest River area, along with published resource material, are presented by Bonner County (1989), Hudson (1983), IDPR (1988), IWRB (1995), and Rothrock and Mosier (1997).

Pertinent to the origins of timber land use in the basin was the Northern Pacific Railroad, which in the 1880s linked northern Idaho to the rest of the nation. Rail transportation provided access to markets that needed forest products. Government and industry surveys had recorded the abundance of large stands of timber in the Priest River basin. Midwestern lumber companies, such as Weyerhauser and Humbird, purchased land and began logging operations. The first large scale logging was conducted in the Lower West Branch watershed with selective harvesting of large and valuable trees (USFS 1999). In the Priest Lake area, railroad spurs, flumes and splash dams were built to move logs down major tributaries. Logs were transported across the lake to the outlet, and floated down Lower Priest River to mills at Priest River. These log drives continued until 1950 when the initial Priest Lake Outlet Dam was constructed.

National concern over conservation of natural resources led to the Forest Reserve Act of 1891, under which the Priest River Forest Reserve was established, in 1897. The Forest Homestead Act of 1906 provided for settlement of lands, primarily associated with agriculture, resulting in many privately owned tracts within the Forest Reserve. The Forest Reserve subsequently evolved into the Kaniksu National Forest, and later was combined with other forests to become the Idaho Panhandle National Forests. Excluded from federal ownership was the area east of Lower Priest River and Priest Lake which became Idaho state lands through indemnity land selection.

Estimated population of the Priest River basin for 1994 was 4,400 people (IWRB 1995). In 1994 the city of Priest River had a residential population of 1,680 (IWRB 1995). Population fluctuates widely within the Priest Lake basin, and this reflects the recreation based nature of the area. In 1994 the Bonner County Assessor's Office reported 1,707 single family residences in the Priest Lake area, about 72% of these on privately owned property (Bonner County Assessor's Recap, Priest Lake Area). Approximately 15% of these residences have year-round occupancy. During peak season (mid-summer), second homes and cabins become occupied by families. The average, weekend peak season resident population for Priest Lake (excluding resort lodging) was estimated by Bonner County at 4,945 persons.

2.1.2.4 Area Industry

Timber harvesting and lumber mill processing has long been and remains the most important industry in the Priest River basin. Over eighty-five percent of the basin's land is publicly owned, and these lands are managed primarily for sustained yield timber production in mostly second-growth stands. Exclusions from the timber base include Special Management Areas (SMA) such as the Upper Priest Lake Scenic Area and the Selkirk Crest SMA. Timber harvesting also occurs on private holdings.

The bulk of state owned property is considered commercial forest land and administered by IDL. These state lands are managed under the Idaho Constitution as endowment land where revenues generated from timber sales are placed in trust for state education. The annual cut for the Priest Lake Supervisory Area is currently established at 16 million board feet (MMBF)/year (IDL 2000b). Timber harvesting on national forest land is administered by the USFS Priest Lake Ranger District. Sustained annual yield for the District is estimated at 8-12 MMBF/year. Currently, there is accelerated timber harvesting activity on west side lands in association with a significant Douglas-fir beetle infestation (USFS 1999).

Road construction associated with timber harvesting, as well as construction of unpaved residential and recreational access roads, has long been recognized as a potential significant source of sediment delivery to forest streams. Erosion and runoff problems from unpaved roads can be compounded by recreational use of these roads, and insufficient funding to properly maintain roads. An extensive network of unpaved roads, with associated zones of upslope cut banks, drainage ditches, downslope fills, and stream crossings, exists in the Priest River basin. A conservative estimate is 3,000 miles of unpaved roads, which includes historic roads now closed, trials, and spurs. Many watersheds have road densities exceeding 3 miles/mi^2 and some road densities approach 10 miles/mi^2.

It is extremely difficult to quantify the road network because of incomplete inventories (particularly on private lands), and the network is constantly changing with construction of new roads, annual reopenings, closures, and permanent abandonments (road obliteration with culverts pulled and erosion control measures applied). Some roads have seasonal closures in association with grizzly bear recovery management (USFS 1995), and mountain caribou recovery management (IDL 1992). Some of the road network has been constructed for public transportation, recreational access, and residential access. Pertinent details of the road network for §303(d) listed streams and TMDL considerations will be presented in Section 3.

Agriculture and livestock have been a part of the basin history since the early 1900s, but the extent of this industry, particularly in the Priest Lake basin, is probably less wide spread now than at any time in the past (Priest Lake Planning Team and Rothrock 1995). There are significant acres of commercial livestock and hay cropping operations in the lower half of the basin.

Although interest in mineral extraction in the basin has surfaced from time to time since the turn of the century, no large scale mining operations have ever been shown to be feasible (IWRB 1995). Where mining has occurred the primary metals of interest included lead, gold, silver, and zinc. Currently there are no active mines. There are active sand and gravel pits to support construction activities.

In the Priest Lake basin a primary industry is based on recreation/tourism in the way of resorts, marinas, and related services. This industry extends down to the city of Priest River as seasonal home owners and tourists use retail services. There has been substantial growth of tourism and summer home construction during the 1990s, including visitations during the winter months with the popularity of snowmobiling.

2.1.2.5 Local Groups Working on Water Quality Issues

In 1991 the Idaho Legislature directed the formation of a Priest Lake Planning Team whose purpose was to formulate a water quality management plan for Priest Lake. The 12 member planning team was composed of individuals representing local watershed land managers, user groups, and interest groups. The planning team completed a lake management plan in 1995, and in 1996 the plan was adopted by legislative vote, and signed into Idaho Code by Governor Philip Batt. The planning team was restructured into a 15 member Priest Lake Management Plan (PLMP) Steering Committee, and continues to provide direction for DEQ implementation of lake plan programs. In 1997, the Panhandle Basin Advisory Group (BAG) nominated and DEQ Administration appointed the steering committee as a Watershed Advisory Group (WAG) to review, comment and provide recommendations on the Priest River SBA and TMDL, and as community liaison for TMDL implementation.

The Idaho Water Resource Board adopted the Priest River basin component of the Comprehensive State Water Plan in 1990 (IWRB 1990), and reviewed the required 5 year reevaluation of the Basin Plan in 1995 (IWRB 1995). As previously described in Section 2.1.2.2, actions of the IWRB include designation of State protected river reaches, application for minimum stream flows, and evaluation of operations of the Priest Lake outlet dam. The Basin Plan has included substantial public participation throughout the development and review process (IWRB 1995).

The Panhandle Bull Trout Technical Advisory Team (representatives from state and federal agencies, and tribes) has compiled a draft problem assessment for the Priest Lake key watershed, and had formed a Priest Lake Bull Trout WAG. While there are ongoing fish surveys and enhancement work in Upper Priest Lake and its tributaries, the final bull trout Problem Assessment and Conservation Plan for Priest Lake has been put on hold. Recently, the USF&WS has initiated efforts to establish a Bull Trout Recovery Goal and Recovery Criteria for the Priest River basin to be included in the Clark Fork Recovery Chapter.

Personnel of the USFS Priest Lake Ranger District and IDL Priest Lake Supervisory Area administrator major land holdings in the basin, including management of road building, maintenance, and timber sales. These agencies are very involved in water quality issues, and both have representatives on the PLMP steering committee.

The Idaho Soil Conservation Commission, Bonner Soil and Water Conservation District, and the National Resources Conservation Service, continue to initiate programs with local ranchers in the Priest River basin for water quality improvement such as sign-up for the Conservation Reserve Program.

The Selkirk Priest Basin Association is a private organization that has been very active within the basin regarding environmental oversight, public information, and litigation. They are represented on the PLMP Steering Committee.

The Kalispel Tribe of Indians, Natural Resources Department, adopted a Fish and Wildlife Management Plan in 1997 that establishes a commitment to improving natural resources throughout Kalispel Ceded Lands (KNRD 2001).

2.2 Water Quality Concerns and Status

2.2.1 Water Quality Limited Segments Occurring in the Subbasin

In 1994 and again in 1996, ten segments within the Priest River basin were classified as water quality limited under Section 303(d) of the CWA. Waterbody identification numbers, stream segment boundaries, and listed pollutants are found in Table 2-1 (see also Figure 2-2). Watershed size, stream length, channel type, and summer base flow is shown in Table 2-2. The history of listing through evaluation of beneficial uses in §303(d) reports and §305(b) State Water Quality Status Reports, is found in Appendix A.

All Priest River basin §303(d) streams are listed for sediment pollution (except Lower West Branch which had no listed pollutants of concern, but sediment is implied). Nutrients are a listed pollutant for Tango Creek, and dissolved oxygen and temperature are listed for East River. Habitat alteration is listed for Trapper Creek and Two Mouth Creek, and flow alteration is listed for East River.

It is DEQ's position that habitat and flow alterations, while they may adversely affect beneficial uses, are not pollutants under Section 303(d) of the CWA, and therefore, TMDLs will not be developed to address habitat and flow alterations as pollutants (IDEQ 1999). EPA is in agreement with this position and has incorporated it into their new §303(d) rules (CFR July 13, 2000). Implementation of these rules is on hold until at least January 2002.

The 1998 §303(d) List recommended removal (de-listing) of the following Priest River basin water bodies from the 1996 §303(d) List as DEQ determined that they were meeting their beneficial uses: Middle Fork East River, Lamb Creek, Tango Creek, and Trapper Creek (IDEQ 1999). The 1998 §303(d) List was approved by EPA on May 1, 2000. However, for Priest River basin the 1998 §303(d) List was determined without the full benefit of information collected, analyzed and presented in this Subbasin Assessment.

2.2.2 Applicable Water Quality Standards

2.2.2.1 Beneficial Uses

Surface waters in Idaho are protected by a set of rules established in Water Quality Standards and Wastewater Treatment Requirements, which are part of the Administrative Rules of the Department of Environmental Quality, Volume 58, Title 01, Chapter 02 (these rules were moved from Volume 16 to 58 when DEQ became a department in 2000). These rules protect "beneficial uses" of the surface waters of the state. Beneficial uses are established in IDAPA 58.01.02.100 as follows (IDEQ 2000):

<u>Water supply</u>

waters which are suitable or intended to be made suitable for:

- *agricultural* - crop irrigation and water for livestock,
- *domestic* - drinking water,
- *industrial* - water for industrial purposes.

<u>Aquatic life</u>

waters which are suitable or intended to be made suitable for the protection and maintenance of viable communities of aquatic organisms and populations of significant aquatic species as follows:

- *cold water biota* - optimal growing temperatures below 18º C (64º F),
- *warm water biota* - optimal growing temperatures above 18º C (64° F),
- *seasonal cold water* - cool and cold water biota, where cold water aquatic life may be absent during, or tolerant of, seasonally warm temperatures,
- *salmonid spawning* - which provide or could provide habitat for active, self-propagating populations of salmonid fishes.

<u>Recreation</u>

waters are those which are suitable or intended to be made suitable for:

- *primary contact recreation* - prolonged and intimate contact by humans or for recreational activities when the ingestion of small quantities of water is likely to occur. Such activities include, but are not restricted to, those used for swimming, water skiing, or skin diving.

- *secondary contact recreation* - recreational uses on or about the water and which are not included in the primary contact category. These activities may include fishing, boating, wading, infrequent swimming, and other activities where ingestion of raw water is not likely to occur.

<u>Wildlife Habitat</u>

waters which are suitable or intended to be made suitable for wildlife habitats.

<u>Aesthetics</u>

applies to all surface waters of the state.

Beneficial uses for many Idaho water bodies are listed in the Water Quality Standards. However, the only §303(d) listed segment in the Priest River HUC that is currently cited in the Standards is Lower Priest River, from Priest Lake to the mouth (cited in IDAPA 58.01.02.110.06). Lower Priest River has the

Table 2-6. Designated and Existing Beneficial Uses for §303(d) Listed Streams in the Priest River Basin

Stream Name	Aquatic Life		Water Supply			Recreation		Wildlife Habitats	Aesthetics
	Cold Water Biota	Salmonid Spawning	Dom.	Agri.	Ind.	Primary	Secondary		
Trapper Creek	D*	E		D^	D^	D*		D^	D^
Two Mouth Creek	D*	E		D^	D^	D*		D^	D^
East River									
Mainstem	D*	E	E	D^	D^	D*		D^	D^
Middle Fork	D*	E	E	D^	D^	D*		D^	D^
North Fork	D*	E	E	D^	D^	D*		D^	D^
Tango Creek	D*	E		D^	D^		D*	D^	D^
Reeder Creek	D*	E		D^	D^	D*		D^	D^
Kalispell Creek	D*	E	E	D^	D^	D*		D^	D^
Lamb Creek	D*	E	E	D^	D^	D*		D^	D^
Binarch Creek	D*	E		D^	D^		D*	D^	D^
Lower West Branch Priest River	D*	E	E	D^	D^	D*		D^	D^
Lower Priest River	D	E	D	D^	D^	D		D^	D^

D = "Designated" in 58.01.02.110.06 of Idaho Water Quality Standards and Wastewater Treatment Requirements.
D* = "Default Designation" of Undesignated Surface Waters as established through 58.01.02.101 of Standards.
D^ = Designation applies to all surface waters of the state.
E = "Existing use" identified as result of Beneficial Use Reconnaissance Project monitoring or observation.

following designated beneficial uses: domestic water supply, cold water biota, primary and secondary contact recreation, and as a special resource water. The remaining §303(d) listed streams do not have specific beneficial use designations in IDAPA 58.01.02.110. These water bodies are assigned interim designations of cold water biota and primary contact recreation or secondary contact recreation (IDAPA 58.01.02.101.01). For non-designated uses of a particular water body, an "existing use" such as salmonid spawning may be assigned based on the results of the DEQ - BURP monitoring, or other documented data and observations. Existing beneficial uses are those uses that existed on or after November 28, 1975, the effective date of the CWA. Designated and existing uses for Priest River basin §303(d) listed streams are presented in Table 2-6.

2.2.2.2 Criteria for Protecting Beneficial Uses

Beneficial uses are protected by a set of criteria, which include *narrative* criteria for sediment and nutrients, and *numeric* criteria for toxic substances, fecal coliform bacteria, dissolved oxygen, pH, chlorine, dissolved gas, ammonia, temperature and turbidity (IDAPA 58.01.02.250). Numeric criteria for those water quality parameters that would be applicable (potential violation of Standards) in the Priest River basin are listed in Table 2-7. The current version of the Standards, adopted April 5, 2000, contain

Table 2-7. Selected Criteria Supportive of Designated Beneficial Uses in Idaho Water Quality Standards

Designated and Existing Beneficial Uses			
Primary Contact Recreation	**Secondary Contact Recreation**	**Cold Water Biota**	**Salmonid Spawning during spawn and incubation period for inhabiting species**
Water Quality Standards Prior to year 2000: IDAPA 16.01.02.250			
500 FC/100 ml any time; and 200 FC/100 ml in 10% of samples over 30 days; and Geometric mean of 50 FC/100 ml of five samples over 30 days.	800 FC/100 ml any time; and 400 FC/100 ml in 10% of samples over 30 days; and Geometric mean of 200 FC/100 ml of five samples over 30 days.	pH between 6.5 and 9.5 DO exceeds 6.0 mg/L	pH between 6.5 and 9.5. DO exceeds 6.0 mg/L in water column DO exceeds 5.0 mg/L intergravel
		22°C (72°F) or less daily maximum with a maximum daily average no greater than 19°C (66°F)	13°C (55°F) or less daily maximum with a maximum daily average no greater than 9°C (48°F) Bull trout: daily average of 12°C or less during June, July & August for rearing; and daily average of 9°C or less during September & October for spawning.
		turbidity shall not exceed background by more than 50 NTU instantaneous or more than 25 NTU for more than 10 consecutive days.	
Water Quality Standards Adopted April 5, 2000: IDAPA 58.01.02.250			
406 *E. Coli*/100 ml any time; or Geometric mean of 126 *E. Coli*/100 ml of five samples over 30 days.	576 *E. Coli*/100 ml any time; or Geometric mean of 126 *E. Coli*/100 ml of five samples over 30 days.	pH, DO, temperature, and turbidity same as above.	pH, DO, and temperature same as above.
		Seasonal Cold Water - IDAPA 58.01.02.250.03. Between summer solstice - autumn equinox: 27°C or less daily maximum, daily average of 24°C or less.	
		Temperature Exemption - IDAPA 58.01.02.80.04. Exceeding the temperature criteria in Section 250 will not be considered a water quality standard violation when the air temperature exceeds the ninetieth percentile of the seven-day average daily maximum air temperature calculated in yearly series over the historic record measured at the nearest weather reporting station.	
EPA Bull Trout Temperature Criteria: Water Quality Standards for Idaho, 40 CFR Part 131			
			7 day moving average of 10°C or less maximum daily temperature for June, July, August, and September for bull trout rearing and spawning.

some revisions and additions from prior rules that are pertinent to the Priest River SBA. These revisions include: using counts of *E. coli* bacteria as Standards violation criteria for primary and secondary contact recreation instead of fecal coliform (FC) bacteria; a new temperature exemption clause; and the addition of Seasonal Cold Water aquatic life use designation which may be applicable for Lower Priest River. The EPA has established bull trout temperature criteria for most streams in the Priest Lake basin, and also the East River in the Lower Priest River subbasin. EPA has listed specific stream names falling within the bull trout temperature criteria (Water Quality Standards for Idaho, 40 CFR Part 131). The EPA criteria is shown in Table 2-7.

Narrative criteria for sediment (IDAPA 58.01.02.200.08) states that: "Sediment shall not exceed quantities specified in section 250 or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350."

Narrative criteria for excess nutrients (IDAPA 58.01.02.200.06) states: "Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other aquatic growths impairing designated beneficial uses."

Narrative criteria for floating, suspended or submerged matter (IDAPA 58.01.02.200.05) states: "Surface waters of the state shall be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses. This matter does not include suspended sediment produced as a result of nonpoint source activities."

The CWA requires States to designate which beneficial uses that surface waters support. Water Quality Standards consist of uses and criteria; some criteria are use specific (numeric criteria of IDAPA 58.01.02.250), others apply regardless of use (general surface water criteria of IDAPA 58.01.02.200 including narrative sediment and nutrient criteria). If a water body has designated or established existing beneficial uses, numeric criteria specific to the use apply to the water as a minimum requirement for support status.

2.2.3 Summary and Analysis of Existing Water Quality Data

2.2.3.1 Inventory of Data Sources

A table has been prepared which summarizes various data collection efforts in the Priest River basin since 1986 (Table 2-8).

- The DEQ BURP sampling of macroinvertebrates and measurements of habitat parameters has been conducted on all §303(d) wadable streams in the Priest River basin, as well as the large river BURP protocol on Lower Priest River (IDEQ 1997b). On some but not all streams, there has been BURP electro-fishing efforts. In 1999 the BURP protocol called for the sampling of fecal coliform and *E. coli*, but only a few listed streams in the basin were sampled. The results of BURP monitoring are primary data for indicating support status of beneficial uses for listed streams, and these support status assessments are presented in Section 2.2.3.4. BURP surveys have also been conducted on several non-listed streams in the basin, and these are (Figure 2-2): Upper Priest River, Hughes Fork, Gold Creek (a tributary to Hughes Fork), Caribou Creek, Lion Creek, Indian Creek, Hunt Creek, Soldier Creek, Big Creek, main stem Granite Creek, South Fork Granite Creek, and Upper West Branch Priest River.

Table 2-8. Available Data Sources for §303(d) Listed Streams in the Priest River Basin

Period of Record	Sampling and Monitoring Programs	Trapper Creek	Two Mouth Creek	East River			Tango Creek	Reeder Creek	Kalispell Creek	Lamb Creek	Binarch Creek	Lower WB Priest River	Lower Priest River
				Main Stem	Middle Fork	North Fork							
1994-2000	DEQ BURP: habitat and macroinvertebrates	2 sites	2 sites	1 site	3 sites	2 sites	1 site	3 sites	5 sites	4 sites	3 sites	4 sites	1 site
1994-2000	DEQ BURP: electro-fishing		Y		Y	Y		Y	Y	Y	Y	Y	
1986-1999	IDFG, USFS, IDL,USGS snorkel or electro-fishing	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y
1997-2000	DEQ, IDL temperature monitoring (HOBO®)	Y	Y	Y	Y	Y			Y		Y	Y	
1990-1999	DEQ, USGS fecal coliform sampling		Y					Y	Y	Y		Y	Y
1997-1998	USFS R1/R4 fish habitat inventory									Y			
1990-1999	USFS Priest Lake Ranger District: field surveys, notes and measurements.						Y	Y	Y	Y	Y	Y	
1993-1995	DEQ Priest Lake study: water column chemistry, physical measurements, water flow	Occass. samples, measur., & flow	Routine samples, measur., & flow				Occass. samples, measur., & flow	Routine samples, measur., & flow	Routine samples, measur., & flow	Routine samples, measur., & flow			
1991-1994	DEQ Stream Segment of Concern assessments:	Y	Y										
1992	DEQ Use Attainability assessments: habitat	Y	Y	Y	Y			Y	Y	Y	Y	Y	
1995-2000	IDL Cumulative Watershed Effects assessments: habitat	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
1990-1998	USGS flow and water column chemistry												Y
2000	Stream bank erosion survey: KSSCD			Y	Y				Y	Y		Y	Y

- The IDFG in its role as State fisheries management for basin streams and lakes has conducted various fish population surveys through snorkel, electro-fishing, netting, and creel census (IWRB 1995). Data also includes bull trout redd counts. Bull trout surveys have increased since the federal listing of this species (Panhandle Basin Bull Trout TAT 1998a). USFS personnel have also conducted electro-fishing surveys within west side streams, as well as IDL on some east side streams.

- DEQ and IDL have installed continuous instream temperature recorders (Onset Computer Corp., HOBO®) within many streams of the basin. Daily average thermographs have been developed for those streams measured.

- The USFS has conducted fish habitat surveys using the R1/R4 Habitat Inventory Procedure on two streams, Lamb Creek and Upper West Branch. This is a survey on major lengths of a stream, and data collected includes: pool frequency, pool formation, residual pool volume, percent fines, and notes on fish encountered.

- USFS personnel from the Priest Lake Ranger District and regional office in Sandpoint have extensive knowledge, and field notes in file cabinets, of watershed and instream conditions of west side streams, along with experience of installing fish habitat enhancement features. Watershed inventories of lower west side streams were particularly extensive in preparation for the Douglas-fir beetle Environmental Impact Statement (USFS 1999). These surveys included channel typing, frequency and formation of pools, habitat ranking, and measurement of percent fines within riffles, pool tailouts and pools. Some USFS data has been gleaned from field notes; a limited amount of quantitative data was available through the annual Watershed and Fisheries Monitoring Results for the Panhandle National Forest (USFS 1992 and 1993); information was extracted from the Douglas-fir beetle EIS (USFS 1999); and recent watershed data has been supplied through a GIS - Kaniksu Geographic Assessment.

- From 1993 - 1995 DEQ conducted a base line water quality study of Priest Lake (Rothrock and Mosier 1997). This included measurement of most streams tributary to the lake with a goal of calculating nutrient and sediment loads. For major stream tributaries to Priest Lake there was routine sampling for: nutrients, suspended sediment, and fecal coliform; instantaneous measurements of dissolved oxygen, temperature, pH, conductivity and turbidity; and stream gauging efforts to establish daily hydrographs. For minor flow streams and streams tributary to Upper Priest Lake there was occasional sampling and physical measurements, a few instantaneous flow measurements, and no stream gauging.

- From 1991 - 1994 Trapper Creek and Two Mouth Creek were evaluated by DEQ for beneficial use impairment and fish habitat condition as Stream Segments of Concern under the Idaho Anti-degradation Agreement with EPA (IDEQ 1994). This work included quantitative measurements such as Wolman pebble count, pool complexity, percent embeddedness, habitat area, Riffle Armor Stability Index, and collection of macroinvertebrates. Fish surveys were done by IDFG.

- In 1992 DEQ conducted a stream habitat survey throughout the Idaho Panhandle to develop a Use Attainability and Beneficial Use Status Assessment (Hartz 1993). Habitat parameters were qualitatively assessed, and there were length measurements of riffles, runs, and pools. Dimension measurements of pools were sufficient to estimate residual pool volumes. All §303(d) listed wadable streams in the Priest River basin, except Tango Creek, had at least one assessment site.

- The USGS has long standing gauged flow stations on two sites of Lower Priest River (Figure 2-1), as well as routine water quality sampling at the lower river station every other year (Brennan *et al.* 1999).

Table 2-9. Selected Parameters and Explanation of Scoring from Idaho Department of Lands Cumulative Watershed Effects (CWE) Process for Idaho (IDL 2000a)

CWE Parameter	Explanation of Scoring
Surface Erosion Hazard Rating	Low, Medium, High: based on a matrix of slope categories (0-30%, 31-60%, and >60%) and predominant soil parent material.
Mass Failure Hazard Rating	Low, Medium, High: based on a matrix of slope categories (0-30%, 31-60%, and >60%) and predominant bedrock/parent material.
Sediment Delivery Score Erosion Source and Delivery Rating from Forest Road Network to Stream Channels. Scores also developed for skid trails and mass failures.	Low, Moderate, High: based on qualitative, weighted point scoring matrix of erosion signs from cut slopes, fill slopes, ditches, and road surfaces. Total sediment source score multiplied by a delivery factor of 1, 2, or 3 reflecting estimated delivery of sediment to stream channels. CWE sediment score converted to tons/mile sediment delivered to streams based on research in LeClerc Creek, WA (McGreer *et al.* 1997)
Canopy Removal Index (CRI) Removal of conifer canopy from harvesting and fire as a percent of total watershed area, adjusted for percent natural canopy closure and openings for other land uses.	From aerial photography, outline areas of forest canopy removal in 20% removal categories. This is removal from timber harvest and fire, and does not include areas of natural openings (rock outcrop or wet meadows for example), nor does it include openings created for other land uses (agriculture). Compute acreages of canopy removal areas and multiply by percent removals. Estimate percent natural canopy closure of the watershed and multiply against acres of forest canopy removed.
Channel Stability Index (CSI)	Low (most favorable), Medium, High (least favorable). Instream qualitative scoring from 8 categories, evaluating: stream bank condition, large woody debris, and channel bottom stability.
Hydrologic Risk Rating (HRR)	Low, Moderate, High. Based on rating curve with CSI on X axis and CRI on Y axis. For example, a CSI of 30 and a CRI of 0.2 (20%) produces HRR = Low, while a CSI of 30 and CRI of 0.75 produces HRR = High.
Temperature Adverse Condition Yes (adverse condition) for any stream channel segment within 200 foot contour interval in which determined canopy closure/ temperature rating is High.	Low or High. Using aerial photography, for each stream segment between 200 foot contours estimate overall percent canopy cover over the stream channel within the segment. Based on salmonid species present, compare determined canopy cover (%) with target canopy cover (%) which varies according to elevation (the higher the elevation the less target canopy cover). If determined canopy cover is less than target cover, the segment is rated as high.

- Under a Memorandum of Understanding with DEQ, the IDL has conducted Cumulative Watershed Effects (CWE) surveys in most §303(d) listed watersheds of the Priest River basin. CWE protocol (IDL 2000a) inventories unpaved forest roads (mostly state and federal roads) for GIS mapping, and collects erosion estimates to identify nonpoint sediment sources. This CWE data is used in TMDL sediment load calculations. The CWE protocol also includes: estimates of stream channel conifer canopy for indications of temperature adverse condition; qualitative assessment of stream reaches for channel stability; and from estimates of watershed canopy removal along with channel stability, forms a hydrologic risk assessment. Since CWE terminology and scoring results are presented throughout Sections 3 and 4 of this report, a summary of terminology and scoring methods has been prepared (Table 2-9).

- Under a Memorandum of Understanding between DEQ, the Kootenai-Shoshone Soil Conservation District, Idaho State Soil Conservation Commission, and USDA Natural Resources Conservation Service (NRCS), a trained crew conducted stream bank erosion surveys during the summer of 2000 within many watersheds of the Coeur d'Alene and Priest River basins. The crew used a GPS unit to map location, and to store stream bank condition scores and measurements in the GPS data dictionary. The end result through NRCS methods and calculations is to develop a Lateral Recession Rate of bank erosion to be used in TMDL sediment load estimates and channel stability analysis.

2.2.3.2 Summary of Basin Water Quality

This section presents an overview of water quality characteristics in the basin. More specific data including temperature thermographs is presented for each §303(d) listed stream in Section 3.

Flow Characteristics - A summary of basin hydrology has previously been presented in Section 2.1.1.2. Specific flow characteristics of listed streams are found in Section 3.

Water Column Parameters - A good data base of water quality sampling exists for streams in the Priest Lake basin and Lower Priest River near the mouth. There has been very little water column data collected from streams of the lower basin (Binarch Creek south), except for temperature recorders placed within East River, Lower West Branch, and Binarch Creek. Some data parameters can be inferred or estimated for lower basin streams collectively, as a whole, by knowing the water volume and water quality characteristics of Priest Lake as it creates the river, and by knowing the water volume and characteristics of the river near the mouth. A proportional equation was established to estimate the influence of certain parameters (TP and TSS for example) of inflowing lower streams (including Lamb Creek) as they changed the data between the lake and lower river station.

pH and DO - No single measurement of DO has been below the cold water biota and salmonid spawning criteria of 6.0 mg/L (Table 2-7), and only a very few pH measurements have been below 6.5 pH. The lowest DO recorded in lake basin streams was 8.2 mg/L and most measurements are greater than 10 mg/L. Lowest DO for the lower river was 7.7 mg/L, and during the warm water summer months DO typically ranges between 8 - 10 mg/L. Most pH values for the river range between 7 - 8.0 units.

Temperature - There are general stream temperature patterns that emerged from the various placements of continuous HOBO® recorders, (excluding the data for Lower Priest River), and these are:

- The warmest period of stream temperatures is late July through mid August.

- Temperatures do not exceed the cold water biota criteria of 19°C daily average, or the daily maximum of 22°C.

- Temperatures in the lower and middle reaches of main stem stream channels commonly exceed the salmonid spawning criteria for cutthroat trout spawning and incubation during July (9°C daily average). Daily averages from early July to early August have mostly ranged between 12.5 – 15°C, with daily maximums reaching 18.9°C. Daily average in Lower West Branch reached 16.8°C as measured in early August 2000. Temperatures in the headwaters of main stems and feeding tributaries have far less percentage exceedances for cutthroat spawning and incubation, and typically have daily averages between 10 – 12°C, and even less than 10°C.

- Temperatures in the lower and middle reaches of main stem stream channels have a high rate of exceedance of the EPA bull trout criteria (7 day moving average of 10°C daily maximum for July through September). There are also exceedances of the bull trout criteria in the State Standards (Table 2-7), but the rate is less than exceedance of the EPA criteria. Again, headwater stream segments have far less exceedances or none at all.

- Lower Priest River near the mouth exceeds the cold water biota criteria during July and August, with mean daily temperatures reaching 23.5°C in 1998. In summer months the river is more a cool water habitat than cold since it largely consists of upper layer water from Priest Lake (the dam radial gates open at the bottom, but only 10 feet or so from the lake surface). Also, the river has miles of wide and shallow slow moving water, with an open view to sky, which leads to warming.

Dissolved Minerals - Using Electrical Conductivity (EC) as a measure of dissolved minerals and salts, the Priest River basin is considered to have soft water with low concentrations of dissolved material. East side streams from Trapper Creek down to Soldier Creek are extremely low, ranging from 10 - 20 *u*mhos EC during spring snow melt, and not much higher in other seasons. On the other hand, Upper Priest River and Hughes Fork measure around 80 *u*mhos during spring, and reach 150 *u*mhos by late summer and fall. These higher values likely reflect extensive belt rock parent geology within the watersheds of the northern streams compared to the dominant granitic geology of eastern streams (Figure 2-4). For mid-western streams from Granite Creek down to Lamb Creek, EC ranges 30 - 40 *u*mhos during spring and 60 *u*mhos by mid-summer. At Lower Priest River the spring range is 40 - 50 *u*mhos (Priest Lake is a consistent 45 - 50 *u*mhos year-round). By late summer the range is 60 - 100 *u*mhos. When using a proportional equation, the lower basin stream composite in late summer calculates to 85 - 180 *u*mhos.

Phosphorus and Nitrogen - Priest Lake basin streams are mostly low in TP and TN. Annual averages for northern and eastern streams, along with Granite Creek, range from 5 - 11 *u*g/L TP, and during spring high flow the averages are only slightly higher. On occasion there is a moderate suspended sediment (TSS) spike with an associated TP reaching 50 *u*g/L. Averages for TN range from 65 - 150 *u*g/L. West side streams from Reeder Creek down to Lamb Creek have higher nutrient concentrations. During the base flow period, TP averages range 14 - 25 *u*g/L and during spring the averages increase to 20 - 40 *u*g/L. Concentrations as high as 90 - 120 *u*g/L TP were recorded in association with high TSS events. The guideline criteria established by EPA for TP concentrations in streams which enter lakes is 50 *u*g/L (EPA 1986). Averages of TN range from 110 - 750 *u*g/L in west side lake basin streams.

Mid to lower western streams have large areas of wetlands, wet meadows, and pasture converted from wetlands and meadows. Vegetative decay, soil characteristics, and possibly agricultural practices produce surface water and ground water with relatively high (within Priest River basin) inorganic and organic nitrogen, iron, and tea colored to reddish brown colored water from iron and organics.

TP samples in Lower Priest River near the mouth have ranged from <10 - 52 *u*g/L (sampled on even years, 1990 to 1998). In 1990 and 1992 when sample size each year was n=23, annual averages were 9 and 16 *u*g/L respectively. During spring runoff concentrations are commonly 20 - 30 *u*g/L. Given that Priest Lake TP is consistently around 5 *u*g/L throughout the year, the spring runoff concentrations observed near the river mouth represents a significant TP input from the lower basin stream composite, and from silt resuspension and bank erosion within the river.

Suspended Sediment and Turbidity - Suspended sediment concentrations during spring runoff are low for northern and eastern lake basin streams. Averages are mostly around 2 mg/L TSS, although Upper Priest River had an average of 9 mg/L in spring 1995. Maximum value sampled was only 17.2 mg/L. Most bedload material in these streams are sized from sand grains and bigger, and would not be reflected in the TSS samples. For Granite Creek and Reeder Creek in the west, TSS in spring is higher, averaging 4.5 mg/L with a maximum 33 mg/L. For Kalispell and Lamb Creeks, averages are near 15 mg/L and maximums reach 65 mg/L. At the highest TSS levels, turbidity in Kalispell Creek reached 25 NTU and at Lamb Creek 40 NTU. The Kalispell Creek sampling included an ISCO sampler, which obtained multiple samples per day during spring runoff of 1995. This data showed that the cold water biota criteria of 25 NTU over background for more than 10 consecutive days would not be approached at Kalispell Creek, and not likely at Lamb Creek.

Sampling for suspended sediment in Lower Priest River has been on an infrequent basis during spring runoff (2-3 samples per runoff period). From visual observations the river seems to be quite turbid during high flow. For one sample in May 1998 the value was 49 mg/L TSS, and in late April 1996 a value of 116 mg/L was recorded. For the latter sample however, the corresponding turbidity was only 9.5 NTU and the TP was <10 *u*g/L, which makes this TSS value suspect. Given that Priest Lake outflow is <1 mg/L TSS throughout the year, a spring runoff concentration around 50 mg/L TSS near the river mouth represents a significant sediment input from the lower basin, again including silt resuspension and bank erosion within the river.

Visual observations of Lower West Branch show a very turbid water during spring runoff. This watershed, as with other lower basin watersheds, has a large area of low elevation sensitive snowpack, moderate to high land use activity, and inventoried sources of significant land and stream bank erosion. The Lower West Branch watershed is flashy, i.e. it responds quickly to winter and early spring rains and flow rate increases rapidly. Two DEQ sampling runs have been made on the Lower West Branch, in May of 1997 and 1998. Both runs were on the falling limb of the spring hydrograph. TSS near the mouth reached 48 mg/l with a corresponding 36 NTU. There is reason to suspect that if sampling occurred on Lower West Branch during the rising limb of the hydrograph, and possibly also on other lower basin streams, that the cold water biota turbidity criteria might be approached, assuming that a background concentration for spring runoff could be established.

Bacteria - Nearly 60 samples for fecal coliform bacteria (FC) were taken between 1993 - 1995 in lake basin streams. Highest value sampled was 270 FC colonies/100 ml at Lamb Creek, but the vast majority of samples were below 50 FC/100 ml (see Table 2-7 for bacteria Standards). Sampling at Lower Priest River shows a maximum of 120 FC/100 ml, with most samples below 50 FC/100 ml. There was also BURP sampling of bacteria on lower west side streams in September 1999. Two samples on Goose Creek, a tributary to Upper West Branch, showed high levels, 660 and 2,100 FC/100 ml (770 and 2,000 *E. coli*/100 ml respectively). These values for *E. coli* exceed the single sample secondary contact recreation criteria of year 2000 revised Standards. The results are attributed to direct access of cattle to the stream. On Upper West Branch below the confluence of Goose Creek, values of 4 samples averaged 87 FC/100 ml and 132 *E. coli*/100 ml. This suggests that the threshold criteria for primary contact recreation of 126 *E. coli*/100 ml geometric mean over 5 samples may have been exceeded.

Macroinvertebrates and Fish - BURP sampling of benthic aquatic organisms within riffle habitat is used to calculate Macroinvertebrate Biotic Index (MBI) scores which are heavily relied upon for determining support status of the cold water biota beneficial use (Section 2.2.3.3). The MBI score is a weighted composite of seven metrics from the laboratory taxonomic identification of samples: percent EPT (mayflies, stoneflies, and caddisflies), Hilsenhoff biotic index, percent scrapers, percent dominance, EPT index, taxa richness, and Shannon's H′ diversity index (IDEQ 1996). MBI scores of 3.5 or greater indicates that the macroinvertebrate assemblage is Not Impaired. All MBI scores collected, for both §303(d) listed streams and non-listed basin streams, are presented in Table 2-10.

A total of 54 MBI scores were determined within the Priest River basin (both listed and non-listed streams). The MBI data has been presented as a box plot (Figure 2-9), using the stem-and-leaf method (SYSTAT 1992). Forty-eight of the scores were 3.5 or higher (89%). The range was 2.6 - 5.3. No MBI scores were below 2.5, or indicating an Impaired macroinvertebrate assemblage. Overall, most riffles within basin streams, with a sufficient gravel component, will support a good assemblage of cold and clean water macroinvertebrates. The issue, as discussed later, appears to be whether excessive sedimentation in some streams has limited the natural area of gravel habitat to support these organisms, thereby reducing the quantity of food source to fish.

Results of fish sampling, and source of data are also presented in Table 2-10. Only three species are listed; westslope cutthroat trout, bull trout, and brook trout. Data is presented in density, fish/100 m^2. **Extreme caution must be taken when comparing results among streams**. Some surveys were done by snorkeling, some by electro-fishing. Electro-fishing methods used by IDFG often include multiple passes within a length sector; methods used by DEQ - BURP crews and USFS are most often single pass sampling. Some fish surveys by USFS were identified as presence/absence, but with stream length and

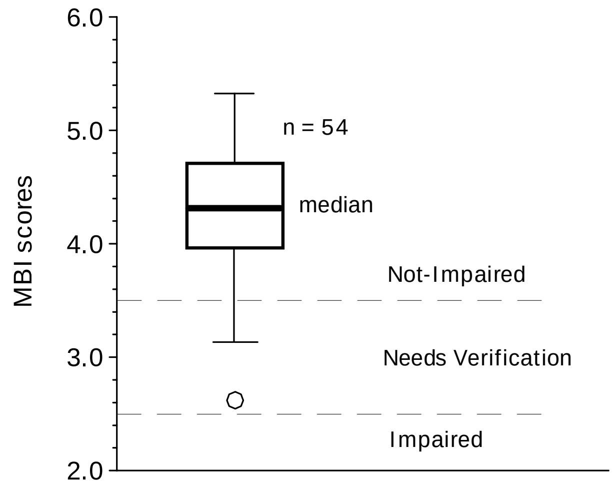

Figure 2-9. Box plot of all MBI scores obtained in the Priest River basin.

width recorded, the data was calculated to density numbers. Seldom were block nets used in electro-fishing surveys (to prevent downstream or upstream escape) and field notes indicated some escape of larger fish. Lastly, BURP electro-fishing protocol since 1998 does not attempt in-the-field speciation of young-of-the-year (YOY) salmonids in the length range of about 20 - 70 mm (juvenile salmonids beginning around 70 mm are recorded as species). The smallest fish captured are simply categorized as YOY salmonids, and samples are vouchered for laboratory identification. Fish surveys by IDFG, USFS, and earlier BURP work, recorded all YOY as specific species.

While the fish sampling data are quite variable, a geographical pattern around the basin does emerge, and the streams of Table 2-10 are ordered geographically (see also Figure 2-2). For the majority of northern streams tributary to Upper Priest Lake, cutthroat trout is the dominant salmonid species (Horner *et al.* 1999, Fredericks 1999, and IDEQ 1994). Within tributaries to Hughes Fork, Upper Priest River, and within Trapper Creek, cutthroat densities are commonly between 3 - 8 fish/100 m^2, and on occasion have ranged between 20 - 26 fish/100 m^2 (Trapper Creek, East Fork Trapper Creek, and Cedar Creek, a tributary to Upper Priest River). Some fish sampled are adult adfluvial cutthroats. In the main stem of Upper Priest River, cutthroat density is low, 0.3 fish/100 m^2 (Horner *et al.* 1999). Bull trout exist within these streams, mostly in low numbers, but density was around 5 fish/100 m^2 in Trapper Creek. Bull trout redds have been routinely counted by IDFG in Trapper Creek since 1993, and have ranged from 0 - 8 redds/yr within the total stream stretch surveyed.

Within the northern streams brook trout are mostly low in numbers, below 0.5 fish/100 m^2, or absent altogether in the surveys. Two exceptions have been Ruby Creek and Rock Creek (tributaries to Upper Priest River), which have high brook trout densities. IDFG electro-fished these streams in 1998, and in Ruby Creek brook trout were dominant and very abundant with density estimated at 34 fish/100 m^2 (Fredericks 1999). All brook trout shocked were removed from the stream. Within Rock Creek, north of Ruby Creek, brook trout were codominant with cutthroats, and captured brook trout were also removed. In a 1999 follow-up survey, 117 brook trout were shocked and removed from Ruby Creek (Fredericks and Venard 2000). Ineffectiveness of the 1998 brook trout removal was in part attributed to extensive woody debris and vegetation cover. Brook trout are considered resistant to over-exploitation because of early age-at-maturity, short life span, and ability to use a wide range of spawning habitats.

Table 2-10. DEQ BURP Scores for Macroinvertebrates (MBI), and Results of Fish Sampling, Priest River Basin

		Fish Surveys: Data Presented in fish/100 m^2 - See Footnote “a”					
Streams (L)= §303(d) Listed (NL)= Non-listed	**BURP MBI Scores**	**Data Source[b]**		**Westslope Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**YOY[c]**
Northern Streams							
(L) Trapper Creek	5.0, 5.1	IDFG:	1989-98	9.3 (1-27)	4.1 (2-8)	low	--
East Fork		IDFG:	1989-98	17.1 (12-22)	0	0	--
(NL) Hughes Fork	4.9, 4.1	IDFG:	1998	3.3	1.4	0.1	--
Boulder Creek		IDFG:	1998	5.5 (4-7)	0	0	--
Muskegon Crk		IDFG:	1998	8.7	0	0	--
Jackson Creek		IDFG:	1998	7.5	0	0	--
Gold Creek	4.7, 5.1	BURP:	1998	2.7	1.8	0.2	0.6
(NL) Upper Priest River	4.8, 4.6	IDFG:	1998	0.3	0.03	0.02	--
Ruby Creek		IDFG:	1998	1.0	0.02	34.4	--
Cedar Creek		IDFG:	1998	21.8	0.03	0	--
Cedar Creek		USFS:	1998	20.2 (1-39)	0.7	0	--
Lime Creek		USFS:	1998	6.6 (4-13)	0	0	--
Rock Creek		IDFG:	1998	3.1	0.1	2.8	--
Malcom Creek		IDFG:	1998	4.6	5.4	0	--
Eastern Streams							
(NL) Caribou Creek	4.4, 5.3	IDFG:	1998	0 LP	0 SP	low	--
		BURP:	2000	0	0	0.7	0.2
(NL) Lion Creek	5.2, 4.9	IDFG:	1983-94	8.6 (1-14)	0.04	0	--
		IDL:	1997	0	0	0	--
		BURP:	2000	0.4	0	0.1	0
(L) Two Mouth Creek	4.0, 4.2	IDFG:	1987-94	14.6 (12-17)	0.1	0.2	--
		BURP:	1994	4.1	0.1	1.1	--
		IDL:	1997	2.3	0	0	--
(NL) Indian Creek	4.9	IDFG:	1983-94	13.4 (7-23)	1.3 (0-5)	2.0 (0-5)	--
		BURP:	1994	7.1	0	0.4	--
(NL) Hunt Creek	4.7, 4.1	BURP:	2000	5.3	0 HP-SNP	0	0
(NL) Soldier Creek	3.3, 4.8	BURP:	1998	0 LPHS	0 SP	2.0	0.5
(L) East River							
Main stem	4.0	IDFG:	1986	0	0	0.2	--
Middle Fork	4.4, 4.2, 4.4	IDFG:	1986	8.1 (0-24)	0.7 (0-2)	1.1 (0-3)	--
Middle Fork		BURP:	1997	0.2	0.4	2.3	--
Middle Fork		IDL:	1998	11.6 (4-18)	0.4	0.4	--
Keokee Creek	4.0	IDL:	1998	18.2	0	0	--
Tarlac Creek		IDFG:	1986	0	4.4	2.1	--
Uleda Creek		IDFG:	1986	4.4	6.6	0	--
North Fork	4.4, 4.3	IDFG:	1986	1.1 (0-4)	0 SP	4.3 (1-12)	--
North Fork		BURP:	1998	0 LPHS	0	1.4	3.6
(NL) Big Creek	3.9, 3.9	IDFG:	1986	4.8 (0-8)	0 HP-SNP	11.4 (3-17)	--
Main stem		BURP:	1997	1.2	0	11.2	--
Happy Fork		IDFG:	1986	13.9 (7-21)	0	60 (13-106)	--
North Fork		IDFG:	1986	7.6	0	8.2	--

Table 2-10. Continued

Streams (L)= §303(d) Listed (NL)= Non-listed	BURP MBI Scores	Fish Surveys: Data Presented in fish/100 m² - See Footnote "a"						
		Data Source[b]		Westslope Cutthroat Trout	Bull Trout		Brook Trout	YOY[c]
Western Streams								
(L) Tango Creek	4.5	USFS:	1996	2.3	0	HPU	0.9	--
(NL) Granite Creek	4.4, 4.5	IDFG:	1987-94	0.5	0.2		0.2	--
Main stem		BURP:	1997	0.05	0		0.2	--
South Fork	4.6, 5.0	IDFG:	1983-94	2.1 (0-7)	0.5	(0-3)	1.5 (0-7)	--
South Fork		BURP:	1997	0.2	0.2		0.5	1.1
South Fork		KNRD:	1997	7.9 (1-20)	0		0.8 (0-3)	--
(L) Reeder Creek	3.9, 4.1	BURP:	2000	0 HP-CU	0	HPU	1.8	2.3
		BURP:	2000	0	0		75.6	0
(L) Kalispell Creek	3.1, 3.3, 4.4, 4.0, 4.0	USFS:	1996	0.1	0	HP-SNP	3.0 (2-4)	--
Main stem		BURP:	2000	0.1	0		1.1	0.1
Hungry Creek		USFS:	1996	in pools	0		abundant	--
4 tributaries		USFS:	1998	0 LPHS	0		6.7 (0-11)	--
(L) Lamb Creek	3.7, 4.2, 3.4, 3.4	USFS:	1995	0 LPHS	0	HP-SNP	9.5	--
		BURP:	2000	0	0		14.1	1.9
(L) Binarch Creek	4.5, 2.6, 3.6	IDFG:	1986	0.2	0	HPU	3.2	--
		BURP:	2000	0.8	0		0	0
(NL) Upper West Branch	4.3, 4.8, 4.6	IDFG:	1986	0	0	HP-SNP	2.0 (1-3)	--
Main Stem		BURP:	1999	0.07	0		1.2	1.2
Solo Creek		USFS:	1999	0.8	0		2.8	--
(L) Lower West Branch	3.7, 4.3, 4.0, 3.6	IDFG:	1987	0 LPH	0	HP-SNP	1.8 (0-5)	--
Main Stem		BURP:	2000	0	0		0.6	0.1
Moores Creek		USFS:	1998	0	0		44.3	--
Moores Creek		IDFG:	1987	0	0		19.3 (2-30)	--
Bear Paw Crk		USFS:	1998	present	0		present	--
Ojibaway Crk		USFS:	1998	0.5	0		4.7 (2-11)	--
(NL) Quartz Creek	MBIs not yet available	IDFG:	1987	0.5	0	HP-SNP	28 (4-57)	--
		BURP:	2000	0.9	0		3.4	1.3
(L) Lower Priest River	IRI not available	USGS:	1998	KP	LP		KP	--

a = For surveys of multiple reaches or multiple years, first number is average, and the range is within parenthesis.

b= IDFG 1986: Horner *et al*. 1987
IDFG 1987: Horner *et at*. 1988
IDFG 1983-94: IWRB 1995
IDFG 1989-98: IDEQ 1994, Horner *et al*. 1999
IDFG 1998: Fredericks 1999, Horner *et al*. 1999
USFS 1996: USFS File Data
USFS 1998-99: USFS 1998b
KNRD 1997: Kalispel Natural Resource Department, 1997
BURP 1994-00: DEQ File Data
IDL 1997: IDL File Data

c = For DEQ BURP electro-fishing in 1998 - 2000, young-of-the-year (YOY) salmonids were not speciated and counted separately.

KP= known to be present from field observations; LP= likely present; LPHS= likely present in headwater streams;
SP= suspected to be present; HPU= historic presence unknown; HP-CU= historically present, current presence unknown;
HP-SNP= historically present, suspected not present now.

Northern streams are unique from other basin streams in at least 3 ways: 1) fishing had been prohibited since the late 1940s, but regulations in 2000 allowed catch-and-release, 2) there are adfluvial cutthroat trout and bull trout in Upper Priest Lake, and 3) land use activity has been low to moderate with forest practices as the only major land use activity.

In east side streams tributary to Priest Lake, from Caribou Creek down to Soldier Creek, cutthroat trout are mostly the dominant salmonid (IDEQ 1994 and IWRB 1995). Densities can be high, such as in Two Mouth Creek, averaging around 15 cutthroats/100 m^2 in IDFG surveys between 1987-94, and cutthroat densities were also good in Lion and Indian Creeks (IDFG snorkel surveys between 1983-94). Salmonid numbers as a whole were very low in Caribou Creek and Soldier Creek, but sampling has been minimal. Bull trout were present in low numbers in Lion Creek, Two Mouth Creek and Indian Creek. From historical accounts adfluvial bull trout were common in Priest Lake and likely migrated for spawning to most streams tributary to the lake. Brook trout were present in most east side streams, mostly in low numbers.

East River and Big Creek, two east side streams tributary to Lower Priest River, have been electro-fished. Bull trout are present in the Middle Fork East River, and also were found in two Middle Fork tributaries, Tarlac Creek and Uleda Creek. Bull trout samples did include an occasional fluvial adult. Cutthroat densities within the Middle Fork and Big Creek commonly range between 3 - 12 cutthroats/100 m^2 with a sample maximum of 24 fish/100 m^2. Brook trout are common in the Middle Fork. Brook trout are dominant in the North Fork East River where cutthroat density was low, and no bull trout were sampled although they are suspected to be present. Brook trout densities in Big Creek were found to be one of the highest in the basin. Average density was around 11 brook trout/100 m^2, and in one reach density was 107 fish/100 m^2 (Horner *et al*. 1987).

Moving over to the west side, sample densities within the main stem of Granite Creek have been low for all salmonids, but this is a large stream and difficult to sample. Bull trout have been present in the sampling. The South Fork of Granite Creek is a major tributary and considered to have good fish habitat conditions. Cutthroat trout are dominant, and in one snorkel survey the average density of six sampling stations was 8 cutthroats/100 m^2 with a maximum of 20 fish/100 m^2 (Kalispel Natural Resource Dept. 1997). Bull trout are present in low numbers, and average brook trout densities have not exceeded 1.5 fish/100 m^2.

For the remaining western streams, from Reeder Creek south to Lower West Branch, brook trout are clearly the dominant species, cutthroat densities are very low and are mostly found in headwaters and small tributaries, and no bull trout have been sampled in the last 15 years. In mid to lower main stem reaches of Reeder, Kalispell, Lamb, and Binarch Creeks, average brook trout densities ranged from 0 - 12 fish/100 m^2. In the main stems of Upper West Branch and Lower West Branch, brook trout densities were lower averaging around 2 fish/100 m^2, and are considered unproductive stream reaches (Horner *et al*. 1988). Some tributary streams and main stem headwaters have been found to have high densities of brook trout. Moores Creek, a tributary to Lower West Branch, averaged 19 brook trout/100 m^2 with a maximum of 30 fish/100 m^2, and Quartz Creek averaged 28 brook trout/100 m^2 with a maximum of 57 fish/100 m^2 (Horner *et al*. 1988). The headwaters of Reeder Creek exhibited 76 brook trout/100 m^2 (BURP electro-fishing in 2000).

There have been no recent netting, angling, creel census, or electro-fishing surveys by IDFG in Lower Priest River. In 1998 the USGS conducted, for the first time, backpack and boat electro-fishing at the lower river station (Brennan *et al.* 2000). The only salmonid captured was mountain whitefish. A total of 21 mountain whitefish were captured (density was not reported), representing 15% of the total catch.

The dominant species sampled was largescale sucker (*Catostomus macrocheilus*), with 45 individuals and 33% of total catch. From field observations and conversations with local fishermen, it is known that the river does contain fluvial cutthroat trout, and also brown trout, rainbow trout, and brook trout. Based on sampling in Middle Fork East River, the Lower Priest River likely contains some fluvial bull trout.

Stream Habitat - DEQ - BURP surveys included stream habitat evaluations resulting in a Habitat Index (HI) score (IDEQ 1996). For streams with a riffle/run prevalence, which were the vast majority of basin streams surveyed, there were eleven parameters measured or qualitatively assessed. Four primary parameters with maximum scores of 20 each were: percent fines as measured by Wolman pebble counts; qualitative assessment of instream cover for fish; qualitative assessment of gravel/cobble embeddedness by fine sediment; and a score for variety of depth habitats in the way of riffles, runs, glides and pools. Secondary parameters with a maximum score of 15 each were: channel shape (good scores for trapezoidal channels where undercut banks or overhanging vegetation are dominant, to poor scores for inverse trapezoidal channels); the pool+glide/riffle+run ratio (or slow/fast ratio) based on measured lengths; and the measured wetted width/depth ratio. Finally, four parameters of a maximum 10 points each were evaluated qualitatively: stream bank vegetation protection; lower bank stability; disruptive pressures to stream banks (cattle grazing for example); and zone of influence (width of riparian zone and level of human induced influence within riparian zone).

Maximum HI score for the Northern Rockies ecoregion is 165. HI scores of ≥100 are considered Not Impaired habitat (61% or more of maximum), scores <65 are considered Impaired habitat. All HI scores calculated in the basin are shown in Table 2-11.

As described in Section 2.2.3.3, BURP HI scores play a secondary role to biological parameters in determining beneficial use support. Since seven habitat parameters are qualitatively assessed there is some question about the repeatability among BURP crews in the habitat assessment process. One example is variation in identifying pool, riffle, run and glide habitats in the field (IDEQ 1999). In addition, most BURP evaluations were made in main stem channels. There is a lack of habitat assessments in streams tributary to the main stems. However, habit evaluations often give insight to macroinvertebrate and fish sampling results, and habitat evaluations can be used as a guide when considering support status under the WBAG+ policy (see Section 2.2.3.3).

Also included in Table 2-11 are results from the 1992 DEQ Use Attainability (UA) surveys (Hartz 1993). These surveys were done on most streams which were assessed later by BURP, and often in the same general locality. The reach lengths evaluated were approximately 20 times bankfull width, similar to BURP. Habitat scores were based on qualitative assessments and included such factors as substrate composition, instream cover, stream bed deposition or scouring, pool quality and complexity, canopy cover, and condition of stream banks. All habitats within the reach were measured for length and width, and this allowed a calculation of number of pools per 100 m. All pools encountered were measured for length, mean width, maximum depth, and depth at tail crest. Pool creator was also recorded. By applying a conversion factor of 0.75 to maximum pool depth as an approximation of mean depth, an estimated Residual Pool Volume (RPV) for each pool was calculated and extrapolated to cubic meters RPV per kilometer stream length. RPV is the amount of water remaining in pools if the stream went to zero flow.

Other habitat measurements and evaluations have been collected by the USFS, DEQ, and IDL. This data is included in Section 3 for each §303(d) watershed evaluated.

A total of 52 BURP HI scores were collected throughout the basin (both listed and non-listed streams). Unlike the MBI results, the majority of HI scores were below the established Not Impaired cutoff score (67% of HIs <100). Only two scores however were below 65, or into the Impaired range. Maximum HI recorded was 117, average score was 92, or 56% of maximum score. A total of 41 DEQ Use Attainability sites were evaluated, and the mean habitat score was 137 (good), or 70% of maximum score.

Table 2-11. DEQ - BURP Habitat Scores (HI), DEQ Use Attainability Scores, and Selected Habitat Values: Priest River Basin

	DEQ BURP Data			DEQ 1992 Use Attainability			
Streams (L)= §303(d) Listed (NL)= Non-listed	HI Scores[a]	Stream Percent Gradient	Percent Fines	Habitat Rating & Scores[b]	No. Pools/ 100 m	Riffle-run Wetted Width (m)	Residual Pool Volume m^3/ km
Northern Streams							
(L) Trapper Creek	M= 108 U= 96	1.6 2.5	29 9	-- good 161	-- 4.8	-- 4.4	-- 104
(NL) Hughes Fork	L= 82 M= 89	1.0 1.0	31 26	poor 103 good 154	3.7 3.8	5.5 4.7	741 157
Gold Creek	L= 112 M= 113	4.0 4.0	20 33	-- --	-- --	-- --	-- --
(NL) Upper Priest River	L= 85 M= 78	1.5 1.9	16 27	good 147 good 158 exce 171 good 154	1.1 0.5 2.0 0.7	10.1 11.1 10.5 11.4	3,498 553 2,462 8,847
Eastern Streams							
(NL) Caribou Creek	L= 88 M= 108	1.2 1.6	35 12	fair 126 good 151 good 157	1.2 2.1 0.7	9.8 11.9 11.8	1,053 5,589 384
(NL) Lion Creek	L= 93 M= 107	0.9 2.0	13 17	fair 112 exce 179	0.9 3.1	10.1 5.4	394 1,214
(L) Two Mouth Creek	L= 96 M= 98	2.0 4.2	16 7	good 139 fair 121	1.6 1.6	5.1 6.6	159 50
(NL) Indian Creek	M= 107	4.0	10	good 159	2.9	6.5	746
(NL) Hunt Creek	L= 89 M= 108	3.0 3.7	16 11	good 139 good 161	2.5 4.8	5.5 4.8	69 153
(NL) Soldier Creek	L= 52 M= 100	1.0 3.5	85 23	-- exce 174 exce 180	-- 1.6 3.7	-- 6.1 7.6	-- 347 156
(L) East River Main stem Middle Fork	 L= 80 L= 89 M= 95 U= 94	 0.4 1.4 3.0 2.9	 10 11 28 15	 -- poor 83 fair 130 good 137	 -- 2.4 0.6 4.7	 -- 8.5 6.8 6.0	 -- 2,308 132 710
North Fork	L= 78 U= 110	1.0 5.0	35 21	-- --	-- --	-- --	-- --
(NL) Big Creek	L= 92 U= 75	2.0 1.9	44 45	-- --	-- --	-- --	-- --

Table 2-11. Continued

Streams (L)= §303(d) Listed (NL)= Non-listed	DEQ BURP Data: HI Scores[a]	DEQ BURP Data: Stream Percent Gradient	DEQ BURP Data: Percent Fines	DEQ 1992 Use Attainability: Habitat Rating & Scores[b]	DEQ 1992 Use Attainability: No. Pools/ 100 m	DEQ 1992 Use Attainability: Riffle-run Wetted Width (m)	DEQ 1992 Use Attainability: Residual Pool Volume m^3/ km
Western Streams							
(L) Tango Creek	L= 117	5.0	31	--	--	--	--
(NL) Granite Creek							
Main stem	L= 85	1.0	54	fair 116	1.1	11.7	668
	M= 88	0.5	30	good 150	0.7	10.6	37
				exce 170	0.7	6.4	234
South Fork	L= 94	2.0	27	--	--	--	--
	U= 118	4.0	39	--	--	--	--
(L) Reeder Creek	L= 105	6.0	24	fair 132	6.2	3.7	178
	U= 103	2.0	46	--	--	--	--
(L) Kalispell Creek	L= 70	1.0	52	--	--	--	--
	L= 95	1.3	44	fair 119	1.3	5.0	695
	M= 74	1.0	93	--	--	--	--
	M= 92	3.3	25	fair 105	6.4	3.0	220
	U= 77	3.0	53	--	--	--	--
(L) Lamb Creek	L= 72	0.5	60	fair 117	6.0	3.0	122
	L= 97	2.5	51	--	--	--	--
	U= 97	3.0	32	vpoor 65	1.4	3.0	2
	U= 99	3.5	46	USFS R1/R4	1.8	4.2	128
(L) Binarch Creek	L= 115	2.7	24	good 144	6.6	3.0	291
	M= 77	4.0	100	--	--	--	--
(NL) Upper West Branch	--	--	--	exce 176	5.2	8.1	2,175
	LM= 101	1.5	42	poor 95	5.1	6.2	1,227
	M= 108	0.6	87	poor 102	4.9	4.4	890
	U= 101	0.5	69	--	--	--	--
(L) Lower West Branch	L= 65	0.5	39	--	--	--	--
	M= 68	0.5	73	poor 105	0.7	6.4	29
	MU= 48	1.0	100	poor 104	0.9	5.2	351
	U= 83	0.5	94	--	--	--	--

a: L= Lower reach sites; M= Middle reach sites; U= Upper reach sites. Maximum HI score = 165.
b: 0 - 69= very poor; 70 - 104= poor; 105 - 134= fair; 135 - 164= good; 165 - 195= excellent

The BURP HI statistics for the Priest River basin indicate an overall mediocre cold water biota habitat condition. Or perhaps portions of the HI scoring scheme and criteria do not specifically fit well for the Priest River basin where there is extensive base granitic geology with glacial till and outwash stream valleys and lowlands.

Some of the BURP habitat parameters were frequently at or below a mid-point score (≤50% of the maximum point total for the parameter). In the primary habitat group, percent fines were below mid-point for 73% of the BURP sites (26% fines or more). This is consistent with observations that sand is a major stream bed component within the granitic watersheds. This also ties into assessments of cobble embeddedness which were below mid-point score for 43% of the BURP sites (50% or more embeddedness). Actual measurements of cobble embeddedness have been made on Trapper Creek (IDEQ 1994) and South Fork Granite Creek (Kalispel Natural Resource Dept. 1997), both considered good fish habitat streams. Embeddedness in lower reaches of these streams averaged greater than 50%. A basin wide analysis of percent fines and embeddedness indicates a less than abundant condition of clean, loose gravels and cobbles optimum for spawning beds and macroinvertebrate habitat.

Instream cover complexity is the presence of various structural elements such as submerged large woody debris, boulders and cobbles, and undercut banks. These structures help maximize fish production by reducing predation, providing refuge, producing micro-habitats that minimize fish energy requirements and provide macroinvertebrate habitat, and overall increase carrying capacity (USFS 1999). The BURP instream cover scores were below mid-point at 31% of the sites. In some cases such as Lower West Branch, low productivity of brook trout are considered to be largely related to poor instream cover conditions (Horner *et al*. 1988).

Of the BURP secondary habitat parameters with a maximum 15 point score, the slow/fast ratio was below mid-point at 92% of the sites. On some streams such as Lower West Branch and Upper West Branch which are often deep and barely wadable, the distinction between lateral scour pools, glides, and runs is often difficult to make and very subjective. Pools provide very important salmonid fish habitat in the way of survival under harsh winter conditions, protection from high summer water temperatures, avoidance from predation, and summer rearing habitat (MacDonald *et al*. 1991). The BURP results indicating overall mediocre pool habitat frequency seem to be also reflected by the UA surveys where number of pools averaged only 2.9 pools/100 m. Seldom were there more than 5 pools/100 m. Narrative in USFS and IDL documents refer to extensive historic logging of riparian cedar and hemlock (prior to the Idaho FPA), and this harvesting reduced the recruitment of large woody debris which are pool formers (USFS 1999).

Another potential parameter to assess the extent of pool habitat is the Residual Pool Volume (RPV). The RPV could serve as an indicator of changes in the sediment load due to forest practices, i.e. pools filling with excessive sediment discharge from roads and stream crossings (MacDonald *et al*. 1991). For comparison among streams, the RPV data of Table 2-11 needs to be stratified either by bankfull width or riffle-run wetted width because the wider the stream, the more relative pool volume. All UA measurements were taken in the low base flow period of late July to early September, so the more accurately measured riffle-run average wetted width is preferred over the more subjectively determined bankfull width.

The RPV data have mainly been presented as a potential monitoring parameter for streams that will undergo a TMDL, implementation for sediment load reduction, and follow-up effectiveness monitoring. This author is hesitant to use the RPV data when considering impairment due to excess sediment because of the variability of the RPV data itself, the variability in features that create pools and thus frequency of pools, and insufficient reference data for comparison. As an example of data variability, the group of streams with average wetted widths ranging from 10 - 12 m exhibited a vast range in RPV from 37 - 8,847 m^3/km. These are the larger main stems such as Upper Priest River, Granite Creek, and Caribou Creek. The maximum RPV was in one reach of Upper Priest River (a 276 m reach), with only two pools

(0.7 pools/100 m), but very large and deep. Another example is within the wetted width group of 7.5 – 10 m where four streams ranged from 1,053 - 2,308 m^3/km RPV, but one reach in Soldier Creek was only 156 m^3/km. And yet the Soldier Creek site had a good frequency of small, boulder created pools (3.7 pools/100 m), and the UA habitat score for this reach was 180, the highest recorded in the basin.

The most comprehensive RPV data are for Lamb Creek developed from a USFS R1/R4 Habitat Inventory Procedure where 8.3 miles of Lamb Creek were surveyed (about three-fourths of the stream length). This stream would be representative of many moderate flow, lower west side streams of extensive low gradient channel and sandy bottoms, historic large fires followed by road building and salvage logging, current logging levels, and some grazing activity. The Lamb Creek watershed also has a moderate level of urbanization in the lower end. Among the 9 reaches that the USFS surveyed, mean wetted width was 4.2 m. The measured RPV among the reaches ranged from 20 - 294 m^3/km and averaged 128 m^3/km. Pool frequency was low, 1.8 pools/100 m, and the primary pool creator was stream meander, and secondly woody debris. The Use Attainability RPV in the 3 - 5 m wetted width group (9 streams), averaged 282 m^3/km with also a higher pool frequency.

Another BURP secondary parameter that was almost always below mid-point score was the wetted width/depth ratio (90% of scores below mid-point, or ratios 15 and greater). For all BURP scores the mean wetted width/depth ratio was 27 (or 3/15 in BURP scoring). The width/depth ratio may serve as a potential parameter to indicate excess sediment accumulation that would reduce stream depth, and to maintain channel capacity, a corresponding increase of stream width (MacDonald *et al*. 1991). A decrease in depth tends to reduce the number of pools. An increase in channel width is achieved through bank erosion and a corresponding increase in direct sediment input to the stream

Large scale canopy openings in the watershed followed by increases in the magnitude of peak flows can lead to an increase in channel width. Widespread stand replacing fires between 1890 - 1939 within headwaters of western watersheds such as Kalispell Creek and Upper West Branch are believed to have caused water yields to increase to the point where the natural channel size could not handle them. Recurrent flooding damaged stream banks and widened streams (USFS 1999). Streams that cut through sandy or other non-cohesive substrates tend also to be wide and shallow (MacDonald *et al*. 1991), and this would be the case for many basin streams flowing through valleys of glacial till and outwash. The observed wetted width/depth ratios then, may be reflecting a basin history of large fires, increased sediment production from road building and logging along with some grazing impact, stream courses through natural sandy substrate, and in part a reflection of methodology by using wetted measurements at low water.

DEQ now believes that the wetted width/depth ratio does not appropriately convey an occurrence of channel widening. Future BURP protocol will likely revise the measurement and habitat index scoring of channel dimensions.

2.2.3.3 Evaluation Methods of Beneficial Use Support Status

Wadable Streams

IDAPA 58.01.02.053 codifies DEQ's procedure to determine whether a water body fully supports designated and existing beneficial uses. It relies heavily upon biological parameters and aquatic habitat, and is a procedure presented in the Water Body Assessment Guidance (WBAG, IDEQ 1996). WBAG requires the use of the most complete data available to make beneficial use support status determinations. Figure 2-10 provides an outline of the wadable stream assessment process for support status determinations of the beneficial uses: cold water biota, salmonid spawning, and primary contact recreation. The evaluation method and sequence for cold water biota determinations shown in Figure 2-10 represents a change in the 1996 WBAG methods as documented in the 1998 §303(d) List (IDEQ 1999). The change places primary weight of determination to biology and secondary weight to habitat evaluation as opposed to equal weight for biology and habitat in the 1996 WBAG.

Figure 2-10. Determination Steps and Criteria for Support Status of Beneficial Uses in Wadable Streams: Section 1.2 - DEQ 1998 §303(d) List

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Cold Water Biota

Numeric Standard Exceedance → Major = NFS

↓ None or Minor

FS ← MBI score ≥ 3.5

MBI score < 2.5 → NFS

2.5 ≥ MBI ≤ 3.5

↓ NV

RIBI = NI ← RIBI Assessments
Call is FS

↓ RIBI = NV

FS ← HI score ≥ 100

HI score < 64 → NFS

64 ≥ HI ≤ 99

↓ NV

Call is NV

Salmonid Spawning

Numeric Standard Exceedance → Major = NFS

↓ None or Minor

FS ← 3 age classes including juveniles

↓ No

FS ← 2 age classes & HI ≥73

↓ No → NFS

If no fish data exists, beneficial use is

Not Assessed

Primary Contact Recreation

exists if ingestion of small quantities of water is likely to occur (2000 Standards)
must meet bacteria water quality standard
if no bacteria data, then support status defaults to cold water biota support call
if cold water biota is NFS then primary contact is Not Assessed

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An agreement by DEQ and EPA in March 2000 calls for the support status determinations above to be reviewed in light of additional biological, habitat, and water chemistry data recently collected within a basin, as well as agency reports with solid findings or conclusions. This additional assessment of support status determinations is referred to as WBAG+. Best professional judgement based on this additional information may result in a support status call other than that determined from the above WBAG flow chart method.

FS =Full Support, NFS =Not Full Support, NV =Needs Verification (inconclusive), NI =Not Impaired

Based on EPA and public comment of the 1998 §303(d) List, along with experience that DEQ has gained from the initial years of water body assessments, a major revision of the WBAG process is being undertaken. The final form and use of this revision (WBAGII) will not however be in place until 2001. In the interim, agreements have been made with EPA to supplement the 1998 WBAG process (using BURP data) with evaluation of additional data collected within the watershed by DEQ and other agencies such as IDFG and USFS (McIntrye 2000). This additional data may include fish population structure and fish density, various instream habitat measurements, and results of watershed sediment load calculations. This interim process for a SBA and TMDL due in year 2000 is labeled WBAG+, with the "+" equating to the additional data assessed outside of the Figure 2-10 flow chart. This "+" information is used to either support or refute a particular water body assessment conclusion based on the Figure 2-10 flow chart.

Initial assessments of Figure 2-10 are for Numeric Standard exceedances. For the Priest River basin, indications of temperature criteria exceedances rely on: data collected by continuous recording HOBO® sensors placed in some basin streams; a continuous recording data logger for Lower Priest River at the lower river station (1998 only); and to only a minor extent, numerous instantaneous measurements for some Priest Lake tributaries. For exceedance evaluation of dissolved oxygen, pH, ammonia, turbidity, and fecal coliform, there is routine data for many tributaries to the lake. For Lower Priest River monthly sampling occurs from April - September every other year for the above parameters (Brennan *et al*. 1999). Fecal coliform and *E. coli* samples were taken on a few §303(d) listed streams in 1999. In no case throughout the basin has there been sufficient bacteria sampling to assess the geometric mean criteria over a 30 day period (Table 2-7).

Evaluation of Numeric criteria exceedances are judged as either "minor" or "major" (IDEQ 1996). This is a best professional judgement based on the data at hand regarding the degree to which the magnitude and duration of the exceedance affected the biota (or human health), and whether exceedances are responsible for the water body not fully supporting its beneficial use(s). Declaration of a major exceedance produces a Not Full Support (NFS, Impaired) status, and overrules any Full Support (FS) status developed from BURP data. If there are no exceedances or only minor exceedance levels, support status evaluations for cold water biota and salmonid spawning turn to the BURP and other supporting data.

The data collected within the Priest River basin show that there have been no Numeric Criteria exceedances within §303(d) listed streams except for stream temperature. It seems clear that for most main stem channels in the basin, lower and middle reaches will exhibit temperatures that exceed the cutthroat spawning and incubation criteria in July (Table 2-7), the State Standards bull trout criteria for July - September, and the EPA bull trout criteria for July - September. In the 1998 §303(d) List, a suggested major exceedance was 3°C above criteria levels (IDEQ 1999). Also, the Standards Temperature Exemption (IDAPA 58.01.02.80.04, 4-5-00) cites exemption of Standards violation based on threshold criteria of air temperatures. For this SBA, stream temperature exceedances were not judged against the Temperature Exemption provision (air temperatures are available from the Priest River Experimental Forest, but they have not been obtained and calculated into a yearly series).

Stream temperature criteria as presented in the Standards, and the relationship to aquatic life beneficial uses has been a subject of great discussion within DEQ and EPA. DEQ is currently conducting a study to reevaluate temperature issues in Idaho, and as directed by the 1998 §303(d) List, waters with only temperature as a suspected cause of impairment have been placed on a separate list (IDEQ 1999).

Once Numeric criteria have been assessed, and show no or minor exceedances, Figure 2-10 drops down to biological criteria. For cold water biota, a MBI score ≥ 3.5 gives FS, and <2.5 gives NFS. Most Priest River basin streams have two or more BURP sites and MBI scores. Generally, the lowest MBI of the stream reaches surveyed is the determining score, i.e. if one segment has a MBI <2.5 and the other(s) are FS, the entire stream is NFS. If a reasonable explanation is evident in the difference of MBI outcomes, such as a land use change, than a boundary change on the stream can be made to better focus where along the water body impairments are occurring (IDEQ 1999).

A BURP site with $2.5 \geq MBI \leq 3.5$ is labeled Needs Verification (NV, inconclusive). In this case the stream is evaluated with the Reconnaissance Index of Biological Integrity (RIBI). This is an outcome based on qualitative and quantitative fish data (IDEQ 1996). The RIBI assessment includes examining the fish population structure as to presence of pollution intolerant species, a dominance of pollution tolerant or introduced species, and age class representation. A RIBI assessment may be Not Impaired (NI) which gives the stream segment FS, or the RIBI evaluation may be NV. If the latter is the case, the stream segment is then evaluated through the BURP HI score. Support status calls based on the HI scores are shown in Figure 2-10.

For salmonid spawning support status, either BURP, IDFG, or USFS fish survey data was used. FS is given if three age classes of fish, including juveniles (fish <100 mm) are present. If this condition is not met, then two size classes present in addition to a HI score of ≥ 73 gives a status of FS. If this second condition is not met then support status is NFS. If no fish length data exists, then the salmonid spawning beneficial use is Not Assessed.

For primary contact recreation, if there are no or minor numeric exceedances of bacteria data, support status is FS. If data does not exist, then the cold water biota status is examined. If cold water biota is FS, then so is primary contact. If cold water biota is NFS, then primary contact is Not Assessed (NA). While domestic water supply is an existing use in the Priest River basin, it is entirely for individual homesteads. The domestic water supply Turbidity Criteria is only applicable to water bodies designated as small public water supplies (IDAPA 58.01.02.250.03.a.iii.1), and thus does not currently apply in the basin. The Toxic Substance criteria for domestic water supply has not been assessed in the basin. Therefore, domestic water supply status is evaluated through the cold water biota status, either FS or NA. Agricultural water supply is evaluated by narrative criteria. Industrial water supply, wildlife habitat, and aesthetics beneficial uses are always FS according to WBAG assumptions.

Following determination of cold water biota and salmonid spawning beneficial use through Figure 2-10, this SBA considered the support status calls in light of additional information collected in the watershed, or the "+" of WBAG. Analysis of the additional information was often the fish and habitat data presented in section 2.2.3.2, along with other evaluations presented within the assessments of 5th order HUCs in Section 3. For some watersheds, analysis included sediment load calculations.

Use of WBAG+ where sediment is the listed pollutant of concern seems to closely relate to beneficial use status based on the Standards Sediment Narrative Criteria. Assessment of the narrative criteria of excessive sediment, such that "designated beneficial uses are impaired" (i.e. a major exceedance), is particularly complicated for west side main stem streams from Reeder Creek south to Lower West Branch. These streams have extensive lengths of low gradient depositional channels which exhibit a high percentage of segments with thick sandy substrate. Suitable gravel and cobble habitat for cutthroat spawning (and where applicable bull trout spawning) seems limited. A predominance of sandy substrate, high width to depth ratios, low quality pools that fill with sand, and sections of eroding stream banks, are some characteristics that may be attributed to excessive sediment accumulation.

Complications for assessment of a major sediment exceedance include: 1) what portion of this condition reflects the natural granitic geology, and glacial outwash and till soils that have a high sand content that is erodible, and which the streams cut through, and in which there were natural accelerated erosion rates from pulse-type disturbances, 2) what portion of this condition is related to land use legacy or historic timber harvesting prior to the Idaho FPA, where for example there was intensive logging and road construction in what is now the FPA Stream Protection Zone, and also historic agricultural practices such as stream channel straightening, and 3) what portion of this condition is related to current land use activities over the last 30 years or so? The question is: would a TMDL implementation for sediment reduction based on current land use activities have any observable effect on improving the impaired beneficial uses? [Note: the

EPA comment on the draft SBA regarding this sentence was, that under the Clean Water Act, the first question to answer is "*Is sediment input resulting in water quality standards (e.g. beneficial uses and water quality criteria) not being met*?"].

A further complication is the presence of introduced salmonids. In all streams of the mid to lower western basin, brook trout are present, and are often abundant and reach harvest-size. Brook trout populations clearly show that the salmonid spawning beneficial use criteria in the 1996 WBAG is being met. However, in many basin streams the fish sampling results indicate that cutthroat numbers are suppressed compared to likely historic population numbers, and bull trout are either extremely low in numbers or they are absent in streams that they likely inhabited historically. Are these population trends of native sensitive species due to habitat impairment from excessive sediment? What role has the introduced brook trout, and introduced lake trout in Priest Lake played in suppressing the populations of native species? And again, will TMDL implementation for sediment reduction ultimately lead to improved habitat conditions that will result in improved population numbers for the native salmonids?

Large Rivers

In 1997 DEQ established a separate sampling protocol for large rivers (IDEQ 1997b). From a practical standpoint of sampling and safety considerations, biological collections and habitat measurements in rivers needed a different approach than in wadable streams. From the standpoint of waterbody ecology, lowland large rivers would have a naturally different makeup of macroinvertebrate communities than upland streams, and the assemblage of attached algae on rocks (periphyton) can be a useful bioassessment to judge human disturbance impact within rivers.

The §303(d) listed segment of Lower Priest River was sampled by the large river protocol in 1998 (one site). Beneficial use status based on the data collected will be judged through the Idaho Rivers Ecological Assessment, currently a draft framework (IDEQ 2001) which will be incorporated into the second iteration of the Idaho Water Body Assessment (WBAGII). Evaluation of Standards exceedances of Numeric Criteria still apply in large rivers.

Support status for aquatic life beneficial use in rivers is based on four ecological components: 1) River Macroinvertebrate Index, a composite of five macroinvertebrate metrics which have some different components than the MBI (for example, percent elmid beetles), 2) River Fish Index, a composite of ten fish metrics including number of cold water native species, percent sculpin, and percent sensitive native individuals, 3) River Diatom Index, a multi metric index based on the assemblage of diatom species, such as percent siltation tolerant species, and 4) River Physicochemical Index, a composite of eight water quality parameters such as temperature, DO, total phosphorus, and fecal coliform. Results of the above four indexes are weighted and integrated into a singular score, 1-100 scale, and then the support status call is based by the integrated score.

For salmonid spawning beneficial use in large rivers, an assessment is made by IDFG on whether a self-sustaining salmonid fishery exists and has been recently documented.

2.2.3.4. Summary Status of Beneficial Uses for Basin Streams

Table 2-12 presents the support status calls for §303(d) listed streams. Discussion of data leading to the support status decisions is presented in detail in Section 3 as each listed stream and its 5th order watershed is examined.

Status calls of Table 2-12 fall into 3 categories:

Table 2-12. Priest River Basin §303(d) Listed Streams: Beneficial Use Support Status

Stream Name	Cold Water Biota	Salmonid Spawning	Primary Contact Rec.	Secondary Contact Rec.	Domestic Water Supply	Agri. Water Supply
Trapper Creek	FS	FS	FS			
Two Mouth Creek	FS	FS	FS			
East River						
Main stem	INSI	INSI	INSI			FS
Middle Fork	FS	FS	FS			FS
North Fork	FS	FS	FS			FS
Tango Creek	FS	FS		FS		
Reeder Creek						
Elev. 2680' - Mouth	INSI	INSI	FS			FS
Elev. 2680' - Headwaters	FS	FS		FS		
Kalispell Creek	NFS	FS	FS		NA	FS
Lamb Creek	FS	FS	FS		NA	FS
Binarch Creek	NFS[a] INSI	NFS[a] INSI		NA		
Lower West Branch Priest River	NFS	NFS[a]	FS		NA	FS
Lower Priest River	TE INSI	FS	FS	FS	NA	FS

FS = Full Support: NFS = Not Full Support: NA = Not Assessed by data collection
TE = Major temperature exceedance of the Standards - cold water biota criteria
INSI = Insufficient Information to make a Status Call
NFS[a] = Based on BURP electro-fishing results and WBAG criteria, salmonid spawning for mid-lower Binarch Creek and middle to lower reaches of Lower West Branch are Not Full Support. However, there are known self propagating cutthroat populations in Binarch Creek, and self propagating brook trout populations in Lower West Branch.

1. §303(d) listed streams proposed for de-listing with sediment as the listed pollutant of concern

   Trapper Creek, Two Mouth Creek, Tango Creek, Reeder Creek from headwaters to elevation 2680', Lamb Creek, Middle Fork East River, and North Fork East River

2. §303(d) listed streams evaluated as impaired for cold water biota beneficial use, and recommended for a sediment TMDL

   Lower West Branch Priest River, Kalispell Creek

3. §303(d) listed streams with currently, insufficient information to completely assess beneficial use status, and status call proposed for deferment until the 2002 §303(d) listing cycle.

   Reeder Creek from elevation 2680' to mouth, East River main stem, Binarch Creek, and Lower Priest River

Some stream segments proposed for de-listing were based on MBI scores consistently above 3.5, Full Support salmonid spawning, and additional fish data that clearly supported a FS status call. These segments were Trapper Creek, Two Mouth Creek, Tango Creek, and middle to upper reaches of Middle Fork East River and North Fork East River.

Lower West Branch on the other hand is judged as Not Full Support and recommended for a TMDL based on poor salmonid densities, poor habitat scores, and a current, high sediment load. A status call of NFS is made even though all four MBIs were ≥3.5.

Kalispell Creek is judged as Not Full Support of cold water biota beneficial use based primarily on electro-fishing results showing low salmonid density. Excess sand bedload within Kalispell Creek is presumed part of its impairment cause. Sediment load calculations along with information supplied by the Forest Service seems to suggest that the current sediment load within this watershed is very moderate, and not the root cause of impairment. Regardless of this assessment of current sediment load, the Priest Lake WAG recommends that for any stream segment exhibiting NFS, a de-listing is not warranted and the watershed should undergo a TMDL. This report follows the WAG recommendation.

Likewise, Binarch Creek is judged as Not Full Support based primarily on electro-fishing results showing low salmonid density. Here also the calculated current watershed sediment load is moderate. For Binarch Creek however the NFS is based on a single DEQ electro-fishing survey, and this SBA recommends support status deferral until further fish sampling is conducted during the summer of 2001.

Lamb Creek and the upper reach of Reeder Creek had abundant brook trout, but absence of cutthroat trout. These reaches are judged as Full Support and recommended for de-listing based on adequate MBIs and brook trout populations. This FS beneficial use status call is disputed by EPA and IDFG in their comment packages to the draft SBA and TMDL (Appendix B). It is the opinion of IDFG that the presence of brook trout, with few or no cutthroat or bull trout present in a stream where they were historically present, is very possibly an indication that water quality has declined (IDFG 2001). In a response letter from DEQ to EPA regarding this matter, DEQ concludes that salmonid spawning and cold water biota beneficial use exhibited by resident trout in these stream segments do meet FS status and current water quality standards (Mabe 2001). DEQ considers that there has been insufficient evidence provided by IDFG to equate the decline of cutthroat trout as primarily related to sediment loading. The same considerations are given for a Full Support status assigned to the lower reach of North Fork East River, although brook trout there are less abundant than Lamb Creek and upper Redder Creek.

In Section 4, sediment source load calculations for Lamb Creek are included for informational purposes if a future interagency plan was developed for restoration of native species. Likewise, sediment load calculations are included for East River as a resource for any future fisheries management efforts to strengthen both the cutthroat trout and bull trout populations.

Lower Priest River has been labeled with a major temperature exceedance for cold water biota where July to mid-August mean daily temperatures at the lower river USGS station ranged from 20 - 23.5°C in 1998 (Brennan *et al*. 1999). These warm temperatures may be adverse physiologically for the resident salmonids: fluvial cutthroat, mountain whitefish, the introduced brook trout, rainbow trout and brown trout, and also fluvial bull trout if they do exist in the river. By all historic accounts cutthroat trout were once thriving and a dominant salmonid in the river. IDFG believes that the combination of warm water, habitat degradation, and introduced salmonids have played a role in the decline of fluvial cutthroat (Horner *pers comm*). In regards to spawning, the only salmonid in which major spawning activity occurs within the river would be the mountain whitefish as other Priest River salmonids primarily spawn in tributaries (Horner *pers comm*). The whitefish spawning period is considered October - March where temperatures are cold.

Warm, mid-summer temperatures would be expected because the river originates as the upper water layer of Priest Lake (epilimnetic water). There is belief among IDFG biologists that since construction of the outlet dam in 1950, and regulation of the summer lake level for recreation purposes, river temperatures are higher now than prior to the dam. However, there is an insufficient historic water temperature record to make a definitive comparison.

Beyond temperature considerations, the cold water biota beneficial use status for Lower Priest River, using the Idaho Rivers Ecological Assessment (IREA, IDEQ 2001), cannot be judged at this time because the IREA methods and calculations are still in draft form and have not undergone complete review and public comment. By the fall of 2001 this tool will be ready to use for a support status call. It is recommended that Lower Priest River remain on the §303(d) List with sediment as the pollutant of concern until evaluated with the IREA. Support status conclusions would be presented in the 2002 §303(d) listing cycle. Salmonid spawning beneficial use is rated as FS based on the single electro-fishing effort conducted by USGS in September 1998 near the lower river station. This data shows multiple age classes of mountain whitefish.

2.2.4 Water Quality Data Gaps

In field survey work there seldom seems to be sufficient data and information to make completely confident judgements about the ecosystem. For §303(d) listed water bodies there are a few cases where either insufficient or lack of information has made determinations of beneficial use status particularly difficult.

Reeder Creek - Up until the summer of 2000 there had been no instream evaluations within the 5 miles of the middle, low gradient reach which is about 63% of total stream length. The BURP macroinvertebrate and habitat data collected in 2000 have not yet been processed.

Binarch Creek - USFS or DEQ needs to conduct an update survey on the cutthroat population within the Binarch Creek Research Natural Area. At a single BURP electro-fishing site downstream of the RNA boundary (sampled in 2000), cutthroat trout were present but with low density. DEQ has requested the USFS to conduct fish sampling during the summer of 2001.

Lower West Branch - BURP electro-fishing in 2000 provided a needed supplement to the 1987 fish survey by IDFG, and placement of a temperature sensor in 2000 provided the first temperature record other than a few spot measurements. It is suspected that Lower West Branch may approach the cold water biota turbidity standard during spring runoff, and this should be investigated.

East River – To judge cold water biota and salmonid spawning beneficial use within the 2.5 mile main stem segment of East River, there needs to be a current electro-fishing effort. The only recorded sampling was within a single reach by IDFG in 1986 that showed low salmonid density. DEQ will conduct fish sampling during the summer of 2001. The East River is also on the §303(d) list with dissolved oxygen (DO) as a concern. No known measurements of DO have been taken within the stream system. DEQ will obtain DO measurements during the summer of 2001 within the Middle Fork, North Fork, and main stem.

Lower Priest River - A comprehensive fish survey by IDFG within the river is needed for use with the Fish River Index of Biotic Integrity as part of the large river bioassessment process, and also for a more complete assessment of salmonid spawning status. DEQ has requested IDFG to conduct an electro-fishing survey within at least one reach during the summer of 2001. In addition, a single BURP site is insufficient to properly assess a water body segment 35 miles in length. Another BURP sampling should be conducted closer to the mouth.

2.3 Pollutant Source Inventory

2.3.1 Point Sources

Within the Priest River basin there are no NPDES permitted point source discharges, and no known point sources covered by a general permit.

2.3.2 Nonpoint Sources

For all §303(d) listed streams, sediment is a pollutant of concern. The following is a general inventory of both assumed and observed sources of sediment in the basin. Details in the way of extent and locality of watershed sediment sources and delivery are given for each listed §303(d) stream in Section 3.

2.3.2.1 Background Sediment Production

Hillslope Erosion - Natural erosion processes include hillslope creep, mass failure, and surface erosion. A common land type in the basin is “gently to moderately sloping glaciated land, derived from granitics” (IDL 1997a and IDL 1997b). In the IDL - CWE assessments, this land type is considered to have a high inherent hazard for surface erosion and a moderate inherent hazard for mass failure. Characterization of west side watersheds by the USFS identifies geologic creep as the dominant erosional process operating in undeveloped forest conditions, with surface erosion as a minor erosional process (USFS 1999).

Fire, Flooding, and Instream Erosion - The historic cycle of large wildland fires (estimated at a 100 - 150 year cycle for the Priest River basin), is normally considered as an event followed by significant short-term sedimentation pulses to streams. However, it is felt by some USFS hydrologists and soil scientists that historic, large stand replacing fires on the west side of the basin may not have greatly led to accelerated surface erosion because of the volcanic ash cap below the organic duff layer (Niehoff *pers comm*). The ash cap is very porus and allows rapid water infiltration into the shallow groundwater stratum. Instead, intense fires may have produced a glazing effect on the ash cap, creating a hydrophobic condition. This condition accelerates water runoff, along with the open canopy from fire, but without a pronounced surface erosion scouring effect. Particularly during episodic precipitation, snowmelt, and flood events following a large fire, excess water runoff would have resulted in excessive stream energy, along with log debris dams, leading to significant stream bed cutting and bank erosion. Current instream degradation in the way of sediment accumulation, pool filling, and channel widening of some west side streams, such as Kalispell Creek, Lamb Creek, and Upper West Branch are in part attributed to large stand replacing fires between 1880 - 1940 (USFS 1999). The last large fires in the basin were in 1967, burning headwater lands of Soldier Creek and Trapper Creek.

2.3.2.2 Sediment Production Related to Human Land Use

Timber Harvesting Prior to the Idaho FPA - Early and mid twentieth century timber harvesting was both in burnt and disease/insect affected areas for salvage logging, and in lands of unburnt, mature growth stands for selective harvest of high value species such as white pine, spruce, hemlock and cedar. During this time there was construction of railroad lines and spurs, flumes and chutes, and a network of transportation roads, skid trails, jammer roads and spurs, and stream crossings. Some of the early transportation system was built close to streams, and within the streams themselves (chutes and flumes). In some areas there were clear-cuts of cedar and hemlock within riparian zones. IDL and USFS land managers consider that these early practices lead to a significant yield of sediment to basin streams and that impairment within some basin streams, such as Kalispell Creek, still reflect these legacy practices.

Current Timber Harvesting - Timber harvesting under the Idaho FPA (in effect since 1974), incorporates BMP standards for road building, harvesting design and extraction methods, stream crossings, maintenance, and the establishment of a Stream Protection Zone (SPZ). Still, as harvesting continues to be a major activity in the basin, there is ongoing disturbance and compaction of forest soils and ephemeral swales by heavy machinery, skidding, and construction of new roads, stream crossings, and landings. Besides unpaved roads as a known significant sediment source, there is also tractor excavated skid trails where the tractor blade scrapes and removes the volcanic ash cap (Niehoff *pers comm*). The method of tractor excavated skid trails has declined in recent years on USFS lands in the basin (Janecek Cobb *pers comm*).

Collectively, there is a significant number of small block, forested acres in the basin that are privately owned and logged, and these are called Non-industrial Private Forest (NIPF). Harvesting activities on these lands fall within the regulations of the FPA as administered by IDL. Forest audits conducted by a team of experts indicate that NIPF land owners generally have more departures from BMPs than found on public and industrial lands (IDL *et al*. 1993). Observations in the basin indeed show some poor practices on NIPF lands that lead to high sediment yield and these include: clear cutting on steep slopes which have lead to mass failures into streams; insufficiently sized and constructed stream crossings which have high erosion and slumping; and poorly built entrances onto main roads which in some cases have completely blocked main road drainage ditches.

Roads: Public Agency and Timber Industry - A road system in forested lands includes: the road surface along with water runoff management structures such as rolling dips and cross culverts; down gradient fillslopes and up gradient cutslopes; drainage ditches; and stream crossings. Road systems produce sediment mass and a percentage of that mass is delivered to basin streams. A common observed and measured feature of road segments is high variability in the mass of sediment produced, and many road segments produce little sediment but a few segments produce a large amount (Luce and Black 1999). The forested road density in the Priest River basin is generally moderate to high, ranging from 2 - 7 mi/mi^2 in many 5th order watersheds (Table 2-13).

Sediment production from the road surface will vary according to such factors as inherent erodibility and runoff producing capacity of the soil and running surface, degree of gravel capping, road gradient and road segment length, sufficiency and maintenance of water runoff management structures, and road use. Road surface erosion may be accelerated by rut formation when vehicles travel the road during the wet, spongy conditions of spring thaw and peak runoff. Road rutting is commonly observed in the Priest River basin, and the rutting channelizes water, increasing runoff velocity and erosional forces. Sediment production from the road surface and other parts of the road system does not equate to sediment yield to a stream. The ratio of yield to production often depends on the sediment exit point in proximity to stream locale, including the area of intervening forest floor which serves to function as a sediment trap settling area (Megahan and Ketcheson 1996).

Sediment production also comes from fillslopes and cutslopes. The cutslopes can contribute sediment to drainage ditches through soil creep, sheet wash, rilling, and slumping. A cutslope can intercept the shallow subsurface flow of forested floors, and this groundwater will surface and weep at the cutslope, at times accelerating erosion and slumping. Within the basin it is common to see weeping and high erosion rates on steep cutslopes, particularly within glacial till soils such as Priestlake-Treble.

Some road maintenance practices produce loosened soil which increases sediment production and yield. For example, a practice on some Bonner County roads in the basin is to yearly, scrape the drainage ditches and pile the spoils on top of the ditch crest. This practice removes ditch vegetation that holds sediment in place, breaks up armoring, and creates significant loose sediment. Observations during fall rains along these roads show very turbid ditch runoff discharging directly into streams.

Table 2-13. Road Statistics for Priest River Basin Watersheds Based on either: Draft USFS Kaniksu Geographic Assessment (USFS 2000a); IDL - CWE Assessment; or DEQ GIS Analysis

Streams (L)= §303(d) Listed (NL)= Non-listed c, d, e = source of data		Watershed area (mi^2)	Total road density (mi/mi^2 area)	Active road density[a] (mi/mi^2)	Stream crossing frequency (#crossings/mi of stream)	Riparian road density (total road mi/ mi^2 riparian area)[b]
Northern Streams						
(NL)	Hughes Fork[c]	60.1	3.1	--	0.6	2.5
(NL)	Upper Priest River[c]	77.6	1.2	--	0.6	1.4
(L)	Trapper Creek[d]	19.2	2.1	1.7	0.9	2.9
Eastern Streams						
(NL)	Caribou Creek[c]	32.8	1.3	--	0.7	1.4
(NL)	Lion Creek[c]	28.5	1.4	--	0.7	2.6
(L)	Two Mouth Creek[d]	24.3	3.2	2.4	1.3	3.7
(L)	Indian Creek[c]	23.5	2.4	--	1.2	4.0
(L)	Hunt Creek[c]	18.7	3.0	--	1.0	3.7
(L)	Soldier Creek[c]	20.6	2.1	--	0.7	2.5
(L)	Middle Fork East River[e]	34.0	4.3	3.2	1.4	6.2
(L)	North Fork East River[e] +main stem, - Lost Creek	23.5	5.1	3.1	1.4	5.9
(NL)	Big Creek[c]	15.3	7.1	--	1.8	6.6
Western Streams						
(L)	Tango Creek[e]	3.1	4.1	1.6	1.4	6.5
(NL)	Granite Creek[c]	99.3	3.0	--	0.6	3.1
(L)	Reeder Creek[e]	13.0	5.9	2.9	1.0	2.9
(L)	Kalispell Creek[e] w/o Diamond Crk subshed	3.0	3.0	1.9	0.8	3.6
(L)	Lamb Creek[e]	24.4	6.2	4.1	1.5	5.7
(L)	Binarch Creek[e]	11.3	5.4	2.2	1.2	5.7
(NL)	Upper West Branch[c]	71.0	5.9	--	1.0	5.5
(L)	Lower West Branch[e]	88.8	5.3	4.0	1.3	4.3
(NL)	Quartz Creek[c]	11.4	5.0	--	1.3	5.2
(L)	Priest River basin[c]	979.0	3.8	--	0.8	3.8

a= Active roads are: total roads - (closed and abandoned roads, and may include old jammer roads; and roads obliterated that have not been accounted for, i.e. not subtracted from the total road network)

b= All riparian road densities are from Draft USFS Kaniksu Geographic Assessment, and equals miles of the total road network divided by the determined riparian area surrounding perennial streams.

c= Data from Draft USFS Kaniksu Geographic Assessment, d= IDL - CWE Assessments, e= DEQ GIS Analysis

Mass failures occur along road systems, often more frequent than the mass failure rate in nondisturbed forests. Mass failures have been partially inventoried in the basin, and overall they occur at a relative low frequency. There are inventoried failures, however, that have slumped considerable tonnage of sediment directly into stream courses.

Some basin watersheds have a significant length of road within 20 - 300 ft of perennial streams. These stream course roads may be on steep benches where there is some distance to the stream, but steep slopes provide little sediment settling function and there is direct runoff to the stream. There are also stream course roads along low gradient valleys which encroach into the riparian and floodplain zones. Besides the high potential of direct sediment yield to streams, these roads can also lessen the function of floodplains by both decreasing flooded area and reducing the degree of stream meander. In some basin watersheds, estimates of riparian road density are as high as 10 - 15 mi/mi^2 riparian area (Panhandle Bull Trout TAT 1998a).

The overall trend in the basin of public agency and timber industry roads is a gradual reduction of the road network mileage. Some roads have been closed, abandoned and/or obliterated; old jammer roads have become brushed in; and new road networks are more efficiently designed and maintained.

Private Roads and Driveways **-** The basin trend in private road density, as associated with conversion of land for rural homesteads, is on the increase. When these roads are inventoried it is clear that many of them do not meet the standards of FPA roads. They are often not capped with gravel, they tend to become heavily rutted, and thus frequently graded which produces loose soil, and they do not have sufficient water runoff management structures when built on steep slopes. Home ownership along stream courses is desirable, and thus overall, there is a high potential of sediment delivery from private roads to streams.

Stream Crossings **-** Sediment yield to streams on a per area basis is generally highest at stream crossings. Sediment production from the road system that approaches stream crossings can be delivered directly, unless there is a good system of pre-crossing runoff diversion, and a presence of structures such as sediment traps or check dams within the approaching ditch line. Gravel armoring of road approaches is another method of reducing sediment yield. Stream crossing culverts can be undersized, damaged, or become plugged, leading to cutslope, road segment, and fillslope failures into the stream. Excessive velocity from culvert discharges can gouge out the downstream channel, which in turn can leave a sufficient drop between the culvert lip and stream bed to prevent upstream fish migration.

Frequency of stream crossings is high in parts of the basin, reaching 2 crossings/mile of perennial stream. Inventoried crossings in the basin range from: well maintained, proper functioning, with BMPs such as gravel armor at the aprons and sediment traps within approaching ditches; to poorly functioning and maintained stream crossings with obvious high sediment erosion and slumping, along with stream bed damage downstream of the culvert discharge.

Agriculture **-** Alfalfa and hay cropping on private lands occurs within the mid-western and lower portions of the basin. For the most part, this activity produces only minor amounts of sediment export except during times of periodic tillage. There are stream segments within private agriculture land that in the past have been straightened. Also, drainage channels have been constructed in surrounding wet soil lands to expedite the spring drainage of water and subsequent tending to hay crops. By eliminating stream meander and creating channelized draining, stream energy increases to the point of widening and damaging stream banks, greatly increasing sediment yield. Occasionally, there is mechanical re-deepening of cross drainage channels, and for the short term this greatly creates additional sediment to the parent stream.

Cattle grazing occurs on private lands as well as federal and state range allotments. There are several observed stream sections where direct cattle access has severely damaged stream banks and eliminated riparian vegetation needed for bank stability and stream shading.

In areas of cattle access to streams, there also is potential for fecal coliform pollution. To date, bacteria sampling has only shown two occurrences of instantaneous numeric criteria exceedance. Goose Creek, a stream tributary to Upper West Branch, had sample values of 770 and 2,000 *E. coli*/100 ml which exceeds the secondary contact criteria of year 2000 revised Standards.

Urbanization - Urban sources of sediment include runoff from access roads, driveways, disturbed hillslopes, and particularly new excavation and construction activities. Also observed is the removal of vegetation from stream riparian zones not regulated by the FPA (no commercial sale of timbered logs). Homestead development in the basin is often comprised of 5 - 20 acre ranchettes, which include large grazing animals that often have free access to streams running through private property.

Instream Bank Erosion – From recorded field observations and results of the 2000 stream bank erosion survey, it is known that stream bank erosion can be a significant direct sediment contributor to basin streams. There are reaches along main stems of C and F channel types with one or two confining banks that are at times high and steep. Areas have been documented where super saturated clay banks are eroding and sloughing, as well as unconsolidated sand-gravel-cobble banks. At times this is a natural condition related to insufficient root stabilizing vegetation. But there are observations where the condition has been obviously exacerbated by historic riparian logging, adjacent road fills, cattle access, and 4x4 access.

It is extremely difficult to partition current stream bank erosion rates to related factors such as: 1) natural occurring and remnants of effects from historic fires followed by increased flows, 2) remnant effects of historic timber harvesting in the riparian zone and construction of a transportation network, 3) excess stream energy of peak flows related to hydrologic openings from timber harvesting, 4) channel straigtening and conversion of wetlands and wet meadows for agriculture purposes, 5) excess current sediment loads which leads to a decrease in stream depth, and 6) the effect of floodplain encroaching roads, as the road can interfere with the stream's natural tendency to seek a steady state gradient, and at high discharge periods may cause the stream to erode stream banks and the stream bed.

2.3.3 Data Gaps for Pollutant Sources

Within the last decade, between the development of GPS recording methods and computer GIS analysis, road surveys through the IDL - CWE assessments, and watershed surveys by the USFS, a good deal of information has been gathered on potential sediment yield sources in the basin. There was a particularly large volume of watershed information gathered in the lower western basin in association with the Douglas-fir beetle EIS. There was very little information however, that would lead to a reasonable estimate on the yield of sediment from eroding stream banks. A stream bank erosion survey conducted on selected stream segments within the basin during 2000 did provide some data for this assessment. Additional surveys of this type are still needed especially on private lands where cattle have free access to streams.

2.4 Summary of Past and Present Pollution Control Efforts

2.4.1 Idaho Department of Lands and Private Timber Industry

Since the 1970s, the Rules and Regulations pertaining to the Idaho Forest Practices Act (IDAPA 20.02.01) have caused State (IDL) and private industrial timber managers to take actions which reduce sediment production due to timber management (Best Management Practices, BMPs). Present timber harvests, road building, stream crossings, and maintenance, have all shown an overall improvement in relation to water quality within the watershed. IDL also administers the FPA for Non-industrial Private Forest (NIPF) timber harvests, but from observations in the basin, the level and effectiveness of BMPs applied fall short of those observed on state, federal, and private industrial lands.

Specific activities by IDL, private industry, and the USFS within the basin, meant to minimize or prevent erosion and sedimentation of streams include: 1) reconstruction of many older roads to meet current standards, 2) improved drainage structures, water bars, grass seeding, and relocating out of riparian areas, 3) upgrading of culvert sizes to prevent catastrophic failure, 4) natural dirt roads have been surfaced with gravel to eliminate road surface erosion, 5) temporary road closure activities with gates and/or berms, and 6) permanent road abandonment (or obliteration, with culverts removed and appropriate erosion control measures applied).

In 1990, Upper Priest River, Trapper Creek and Two Mouth Creek were designated as Stream Segments of Concern under Idaho's Antidegradation Agreement with EPA. A Local Working Committee (LWC) was formed, and the LWC findings were: "that the beneficial uses cold water biota (i.e. trout rearing) and salmonid spawning particularly in regard to the adfluvial westslope cutthroat trout, were not fully supported, and that road construction/maintenance problems, wildfire, and logging were all factors contributing to the stream's condition" (IDL 1991). The LWC established Site Specific Best Management Practices (SSBMPs), and these were adopted and have been applied by IDL (Trapper and Two Mouth Creeks), and USFS (Upper Priest River) since 1991. Some general areas of the SSBMPs include: 1) wider Stream Protection Zones (SPZs), and broader restrictions of harvesting, ground skidding and slash burning in SPZs of perennial class II streams and intermittent streams, 2) construction of slash filter windrows around stream crossings on new roads, 3) planned road construction or reopening of existing roads on geologically unstable land forms shall be reviewed and approved by an interdisciplinary team, and 4) increased inventory, inspection and maintenance of road surfaces, culverts, ditches, cuts and fills.

During the 1990s an IDL Cumulative Watershed Effects (CWE) process was developed (IDL 2000), a process that was designed to be incorporated into the FPA. The CWE process, as previously described in Section 2.2.3.1 (Table 2-9), has been applied in many of the basin's watersheds, both on State and Federal land. One outcome of the CWE process is that if an adverse condition related to cumulative effects of Forests Practices is detected, there is a requirement to develop and apply CWE Management Prescriptions (beyond the standard FPA - BMPs) to address the condition.

2.4.2 U.S. Forest Service

The national Forest Management Act (1976) requires that the Forest Service manage for a diversity of fish habitat to support viable fish populations. Management of Idaho Panhandle National Forest land in the Priest River basin follows standards for aquatic resources identified in the Forest Plan of the IPNF, as amended by the Inland Native Fish Strategy (USFS 1999). Forest Plan goals and objectives in part stipulate that fish habitats will be managed to maintain and improve the habitat of Management Indicator Species (MIS). This includes analysis of cumulative effects of proposed land use activities, and monitoring of aquatic habitats. The westslope cutthroat trout for example is considered a MIS for the basin.

Specific USFS forest management activities to minimize or prevent erosion and sedimentation of streams include those described in the 2nd paragraph of Section 2.4.1 above. USFS management guidelines are intended to meet or exceed the Idaho FPA. In the past ten years the Priest Lake Ranger District (PLRD) has obliterated approximately 160 miles of roads (through contracts), in an effort to restore fish and wildlife habitat (Janecek Cobb *pers comm*). As part of the current Douglas-fir beetle project, the PLRD is removing roads in riparian areas. USFS personnel have also constructed instream fish habitat enhancement structures such as artificial pools.

The USFS examines watersheds and streams on federal land with descriptors of Properly Functioning, Functioning at Risk, and Not Properly Functioning. Several west side watersheds in the basin have been identified with high percentages of the latter two categories, and the stream systems are considered hydrologically destabilized. The USFS establishes Desired Future Condition (DFC) characteristics for specific stream systems, and then sets management goals and objectives so that the systems may eventually reach the DFC. Within USFS documents, legacy issues such as large wildfires and historic logging practices have been identified as main contributing factors to a current condition of disequilibrium for some streams, and the USFS believes that these systems are heading toward a trend of stabilization (USFS 1999). The Binarch Creek watershed is an example. In other systems such as Lower West Branch, it is believed that the channel will not move towards stability until large-scale rehabilitation projects are implemented.

2.4.3 Agriculture and Grazing

Agricultural BMPs have been implemented to a minor degree within the basin, mainly consisting of fencing to deny cattle access to streams. Within the past couple of years however, the Idaho Soil Conservation Commission, the federal National Resources Conservation Service, Sandpoint office, and the Bonner Soil and Water Conservation District, have been quite involved in both assisting with development of TMDLs on agricultural lands, and initiating conservation programs with local ranchers.

As a recent example, the above organizations have established a comprehensive ranch management plan for a fairly large cattle and hay cropping ranch within a lower basin watershed. The land owner has signed a Continuous Conservation Reserve Program agreement whereby 2 miles of a badly degraded stream will be fenced off from cattle, and riparian shrubs will be planted along the stream banks. Another part of the stream rehabilitation, financed from a recently obtained cost-share grant, will be installation of several drop log structures with a goal of developing stream bank and stream bed stability, and form fish habitat pools.

2.4.4 Priest Lake Management Plan

Most efforts of the Priest Lake Management Plan, with implementation managed by the DEQ regional office in Coeur d'Alene, have to this point been focused on pollution prevention programs within and around the perimeter of Priest Lake. The plan however does encompass the entire Priest Lake basin, and there have been certain projects aimed at reducing home development impact on riparian zones near the mouths of streams, and ensure that new commercial and residential development along streams incorporate erosion control BMPs.